HOSPITAL MANAGEMENT AND INFORMATION SYSTEM

FOR RIPHAH INTERNATIONAL HOSPITAL ISLAMABAD

By

Ans Hakeem

Fall-*2K21*-EMBA – *EMP 362700*

NUST BUSINESS SCHOOL

NATIONAL UNIVERSITY OF SCIENCES AND TECHNOLOGY

ISLAMABAD, PAKISTAN

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(2023)

BUSINESS PROJECT ACCEPTANCE CERTIFICATE

It is Certified that final copy of EMBA Business Project written by Ans Hakeem Registration No. 362700 of EMBA 2K21 has been vetted by undersigned, found complete in all aspects as per NUST Statutes/Regulations/MS Policy, is free of errors, and mistakes and is accepted as fulfillment for award of EMBA degree. It is further certified that necessary amendments as pointed out by GEC members of the scholar have also been incorporated in the said business project.

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Signature (Dean/Principal): _____

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NUST Business School

Date: _____

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It would not have been possible for me to accomplish this dissertation without the blessings of Allah, creator of the man and this universe. My deepest regard is for **Dr. Muhammad Kamran Khalid** who has been not less than my savior. He has been providing me with his support, patience, cooperation, and accommodating attitude that led to the conduction of this project. I deeply honor my supervisor **Dr. Muhammad Kamran Khalid**. His encouragement and faith in me helped me not only to grow as an experimentalist but also an independent thinker. In my ways, I have learnt so much from him. My best prayers and wishes are with him forever. Finally, I would like to express my gratitude to my parents for believing in me and putting all their energies to push me up in life. Their support, encouragement and unwavering support compelled me to complete my work with patience and courage. I feel immense pleasure to thank my supervisor **Dr. Muhammad Kamran Khalid** whose encouragement and enthusiasm always helped me in completion of my work.

ABSTRACT

Riphah Hospital has been operating in Westridge since 1996 and has been constantly growing. The management quest for continuous improvement has resulted in several process improvement measures, including a feasibility study for the HMIS. A comprehensive solution is to be designed and implemented to automate the activities of RIPHAH IMMCT Pakistan Railway General Hospital Westridge Rawalpindi with an easy-to-use user interface. It has the capability to administer the total enterprise and efficiently manage the operations of the hospital. The services that are to be offered to the hospital by this management system are: patient registration module, clinical management, ward management with respect to specialty segregating CCUs and ICUs, radiology management, and pathology management. This information system provides an efficient means for the effective data collection, storage, processing, and retrieval of patients coming and being diagnosed at the hospital. A large number of entry forms are being used for capturing, processing, storing, and retrieving the data and information about the patients. The system will not only hold information about the patients but also about different other entities such as doctors, nurses, employees, and other concerned staff members. Also, the system will carry information about the inventory of the pharmacy and also hold a point-of-sale system that carries information about the sales and purchase records for medicines and other medicated products. The proposed system will ease the operations of the hospital by consuming less time and working more efficiently. HMIS is a hospital management information system. It is designed for a multi-functional organization and covers a range of hospital management and operational processes. It is an integrated application with a front-end developer and Oracle as the database. HMIS will be secured at different levels by providing different logins to superusers and other users of the system. HMIS has the portability and connectivity to run on virtually all standard hardware platforms, along with stringent data security and easy recovery in case of system failure. Some of the features of HMIS are that it is user-friendly, has a graphic user interface, is modular, integrated, easy to use, and can be analyzed. It is secure and easy to run and install on different devices.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS ..... **I**

ABSTRACT ..... **II**

CHAPTER 1 ..... **1**

INTRODUCTION **1**

1.1 Introduction to the project 1

1.2 Brief history of the hospital 1

1.3 Objectives of the project 3

1.3.1 Purpose of the Study 4

1.4 Current management and organizational structure 6

CHAPTER 2 ..... **7**

SYSTEM ANALYSIS **7**

2.1 Introduction to the existing system 7

2.1.1 Radiology Module 7

2.1.2 Nursing Module -> 10

2.1.3 Doctors Module -> 10

2.1.4 Registration Module -> 10

2.1.5 Pathology Module -> 13

2.2 Need of computerization 16

2.3 Introduction to the proposed system 17

2.4 Objectives of the proposed system 17

2.5 Proposed solution 18

2.6 Salient features of the proposed system 21

2.7 Compatibility features of hmis 23

2.7.1 Functions 24

2.7.2 New Features Introduced: 25

2.8 Modules of existing solutions 25

2.9 Pros and cons of proposed system.....26

2.10 Considerations for propose system.....27

2.11 Software selection.....28

2.12 Modular approach.....28

2.13 Phases of the proposed system 28

2.13.1 The Study Phase.....29

2.13.2 The Design Phase 29

2.13.3 The Development Phase 29

2.14 Project scope.....29

2.15 Module identification.....30

CHAPTER#3.....31

SYSTEM DESIGN.....31

3.1 Introduction to system design 31

3.2 Logical database design 31

3.2.1 Output Design.....31

3.2.2 Input Design.....33

3.3 Physical database design.....35

3.3.1 Table Design.....36

3.3.2 Data Type Description 36

3.4 Notations for diagrams.....37

3.5 Context DFD 38

3.5.1 Context DFD.....39

3.6 Block diagrams.....40

3.6.1 Basic System Block Diagram 40

3.6.2 Employees Management 41

3.6.3 Patient Management.....42

3.6.4 Pharmacy Management 43
3.6.5 Store Management 44
3.6.6 Laboratory Management 45
3.7 THE DIAGRAM LEVEL-0 DFD....46

CHAPTER 4....52

SYSTEM DEVELOPMENT....52

4.1 Introduction to system developement 52

4.2 System development 52

4.2.1 Forms....52
4.2.2 Data Block 53
4.2.3 Base-Table Data Block....53
4.2.4 Master-Detail Relationships 53
4.2.5 Screen Painters....53
4.2.6 Triggers 53
4.2.7 Alerts 53

4.3 Report generation 54

4.3.1 Report Text Formatter (RTF) 54

4.4 Menu bras....56

4.5 Selected software functionalities 56

CHAPTER 5....58

HMIS IMPLEMENTATION....58

5.1 Introduction to system implementation 58

5.2 System testing phases 58

5.2.1 Unit Testing 58
5.2.2 Integrated Testing 58
5.2.3 System Testing....59

5.3 System conversions 59

5.3.1 Parallel Conversion 59

5.3.2 Direct Conversion 59
5.3.3 Pilot Approach 60
5.4 Proposed system conversion 60
5.5 System evaluation.....60
5.5.1 Features of the System 61
5.6 future enhancements 62
5.7 External and internal interfaces 63
5.8 Justification of ROI.....63
5.9 Revenue generation opportunity.....64
5.10 Cost benefit calculation.....65
CHAPTER 6.....69
THE USER GUIDE.....69
6.1 Introduction to user guide 69
6.2 Logging on and logging.out 69
6.3 Important considerations.....70
6.4 Record navigations 70
6.5 Record manipulations 71
6.5.1 Add Operation.....71
6.5.2 Delete Operation 71
6.5.3 Modify Operation.....71
6.5.4 Retrieve Operation 72
6.6 Report generation 72
6.7 Special considerations.....72
6.8 Security implementation 72
CONCLUSION 73

REFERENCES.....**74**

APPENDICES.....ERROR! BOOKMARK NOT DEFINED.

LIST OF FIGURES

Figure 1: Project Scope Diagram 29
Figure 2: Modules identification 30
Figure 3: Notations for Diagrams 37
Figure 4: The Context DFD 38
Figure 5: the Context DFD 39
Figure 6: Basic Block Diagram 40
Figure 7: Employees Block Diagram 41
Figure 8: Patient Block Diagram 42
Figure 9: Pharmacy Block Diagram 43
Figure 10: Store Block Diagram 44
Figure 11: Laboratory Block Diagram 45

LIST OF TABLES

Table 2: Advantages and disadvantages of new system.....27
Table 3: Data types.....36
Table 4: Different types of reports.....55
Table 5: Justification of ROI 63
Table 6: Revenue generation 64
Table 7: Cost benefit calculation 65

CHAPTER 1

INTRODUCTION

1.1 Introduction to the project

"Islamic International Medical College (IIMC) is a medical institution established in 1996 in Pakistan with a unique vision of combining Islamic ethical values with medical education. Its mission is to produce doctors who are equipped with the best knowledge of medical sciences as well as are good practicing Muslims with the aim of providing quality health services (Siddiqui *et al.*, 2009)." IIMC is working under Riphah International University Islamabad. **IIMCT-Pakistan Railways Hospital** is a teaching hospital of IIMC and is recognized by PMDC and CPSP. IIMCT is one of the leading medical institutions in the country, and its graduates work in almost all the leading hospitals in the country and in other countries like the USA and UK (Khan & Nemati, 2011). In a recent ranking, the Higher Education Commission (HEC) ranked Riphah International University at number 2 among private sector universities in the medical universities category. IIMCT-Pakistan Railways Hospital Rawalpindi is a unique example of a public-private partnership established in August 1998. Islamic International Medical College Trust, Pakistan Railway Hospital Rawalpindi, is a 350-bed teaching hospital (Khan & Nemati, 2011; Siddiqui *et al.*, 2009). The hospital is in Westridge Rawalpindi, a densely populated area of Rawalpindi. All departments of this hospital are upgraded to match the standards of tertiary care and as per the requirements of regulatory authorities. IIMCT-PRH is an ISO 9001:2008 certified hospital providing quality and safe outdoor and indoor health care facilities and treatment to all its patients with qualified and professional medical and paramedical staff along with the latest medical equipment 24/7 throughout the year.

1.2 Brief history of the hospital

Riphah IIMCT-Pakistan Railway Hospital quality policy statement acts as a compass in providing direction and a framework for establishing the key organizational-level performance objectives and targets (Alamgeer *et al.*, 2022). We assure that our quality policy is established, communicated, and understood at all levels of hospitals and the IIMC Trust through training,

regular communication, and reinforcement during performance reviews. Our quality policy is controlled, and it is reviewed annually by the hospital management committee (Alamgeer *et al.*, 2022; Haq *et al.*, 2022).

IIMCT is trying to accomplish the target through:

- Paying attention to patient happiness, treatment, and safety.
- Keeping track of hospital-wide quality indicators and using them as goals for enhancing the efficiency of the quality management system
- Disseminating this policy to every employee of the hospital and making efforts to ensure that everyone is aware of it and follows it.
- Consistent adherence to Islamic and ethical principles and relevant legal and regulatory requirements

The hospital is a distinctive example of public-private cooperation in the health sector. In accordance with this partnership, *Railways Hospital* will be completely under IIMCT's authority for 66 years. To convert this hospital into a three hundred and fifty-plus-bed teaching hospital, IIMCT donated faculty, personnel, and cutting-edge technology. The College of Physicians and Surgeons of Pakistan recognizes all main departments, including medicine, surgery, gynecology and obstetrics, pediatrics, and anesthesia, for FCPS training. For local residents and railroad workers, this facility serves as a full general hospital. This offers both undergraduate and graduate students a wealth of instructional resources. Two lecture halls and thirteen display rooms were constructed in the hospital to accommodate academic demands.

IIMCT offers beneficiaries of railroad employees absolutely free medical care. It is the only general hospital with a fully staffed and equipped department of physiotherapy and rehabilitation. In addition to improving healthcare delivery for Railway patients, the affiliation of donor agencies with IIMCT has significantly reduced the financial burden on the Railway hospital by preventing them from incurring costs that would have otherwise cost millions of rupees to provide such healthcare services. Under one roof, the hospital offers excellent and secure healthcare OPD and IPD services to private and panel patients at a competitive price, as well as to

non-affordable patients at a reasonable discount. Additionally, the OPD and IPD services are free of charge at IIMCT-PRH for Pakistan Railway personnel and their eligible dependents.

The hospital is providing safe healthcare services in the following.

- Emergency Services (24/7)
- Medicine and Allied Specialties
- Surgical and Allied Specialties
- Orthopedic
- Gynecology & Obstetrics
- Pediatrics
- Ophthalmology (Eye)
- Otolaryngology (ENT)
- Dentistry
- Rehabilitation Services (Physiotherapy, Speech Therapy)
- Anesthesiology
- Pathology Laboratory (Hematology, Chemistry, Clinical, Serology, Microbiology, Blood Bank)
- Radiology (X-ray, ultrasound)
- B Clinic
- General OPD

1.3 Objectives of the project

The main objective of this software project is to perform every task by the computer in the *Riphah IIMCT-Pakistan Railway Hospital.* Although there are so many objectives of the project, some major ones are given below:

- Create and maintain a comprehensive database of the patients, laboratory, and pharmacy.
- Computerized registration of the patients, whether they are outdoor, indoor, panel, or non-panel, etc.
- Keeping records of the patients regarding their doctor, medicine, medical tests, charges, payments, etc.

- Generate different reports by computer and keep their records for future analysis and improvements.
- Maintain and record the different doctors working in the hospital.
- Maintain and record the various other staff of the hospital.
- Allow the specific assigned user to retrieve patients' personal information.
- Should calculate the bill due when the patient is discharged from the hospital.
- Allow users to generate reports on individual patients.
- Advanced MIS reporting is available both in graphic and printed form for decision-making.
- Eliminates paperwork and speeds up the process.
- Increase profits and reduce operating costs considerably by handling information in an efficient and effective way.
- Better security and controls must be kept in place to prevent hackers from attempting to manipulate the data, breach, and security.

1.3.1 Purpose of the Study

In order to achieve a high standard of accuracy with paperless activity, the hospital is committed to providing quality and cost-effective health care services in *Riphah IIMCT-Pakistan Railway Hospital* through computerization. We will strive to accomplish this through:

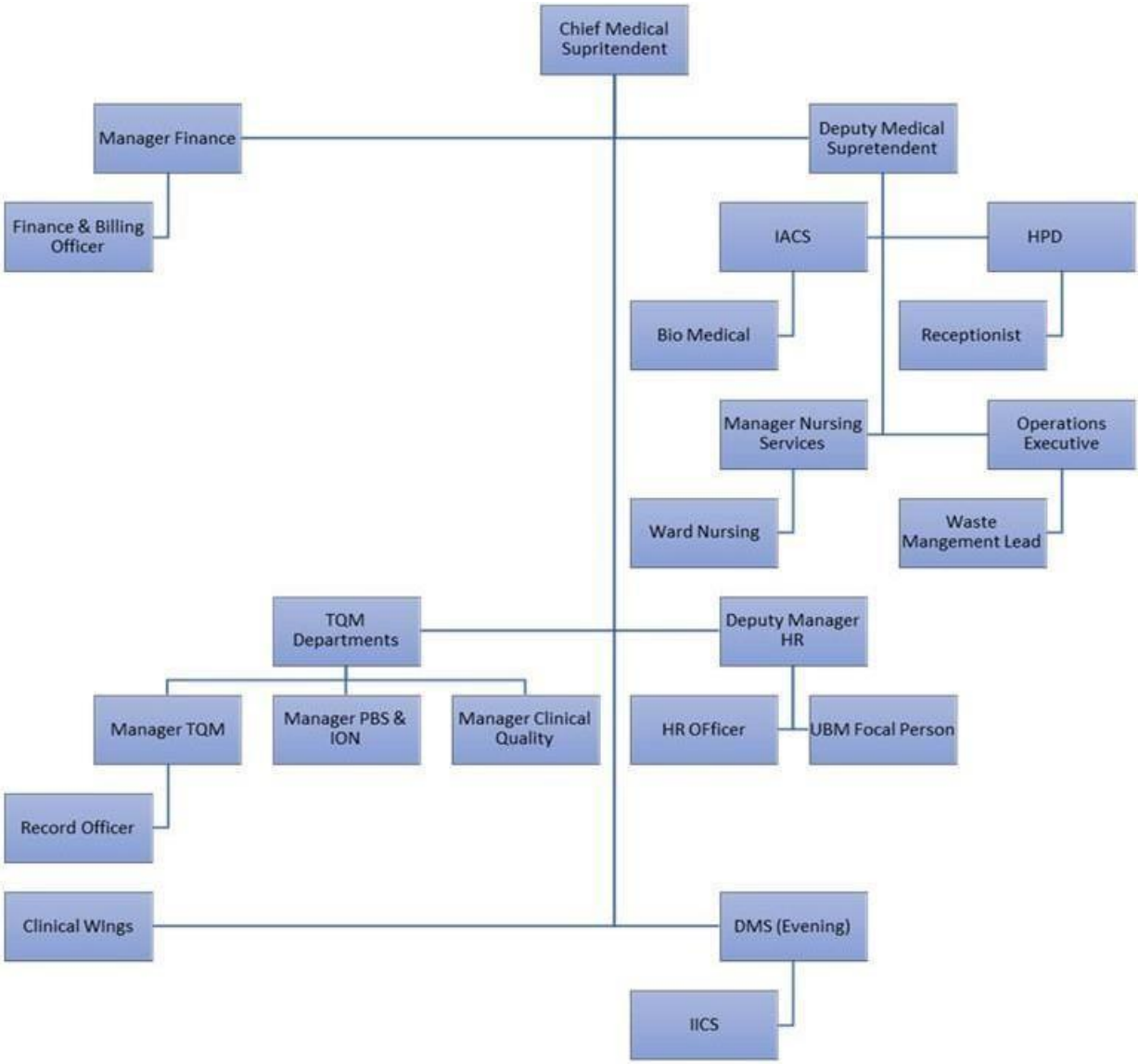
- Pay attention to patient happiness, treatment, and safety.
- Keep track of hospital-wide quality indicators and use them as goals for enhancing the efficiency of the quality management system.
- Disseminating this policy to every employee of our company and making efforts to ensure that everyone is aware of it and follows it.
- Consistent adherence to Islamic and ethical principles and relevant legal and regulatory requirements

The *Riphah IIMCT-Pakistan Railway Hospital* is well known across the world for providing high-quality medical services. They uphold these standards by keeping their ISO 9001 accreditation current.

- Conducting evaluations of mortality and morbidity, quality improvement indicators, and clinical audits.
- Running routine Continuing Medical Education (CME) programs for medical specialists
- Monitoring, measuring, and infection prevention.
- Adhering to external quality regulations on a global scale.
- Ensuring moral workplace conduct for employees.
- Regular audits of clinical standards by external organizations.

	ISO 9001 certified Hospital
International Network of Health Promoting Hospitals & Health Services	IIMCT-PRH is the member of WHO's Health Promoting Initiative
unicef The Baby Friendly Initiative	IIMCT-PRH accomplished the requirements of BFHI (Baby Friendly Hospital Initiative) of unicef.

1.4 Current management and organizational structure



CHAPTER 2

SYSTEM ANALYSIS

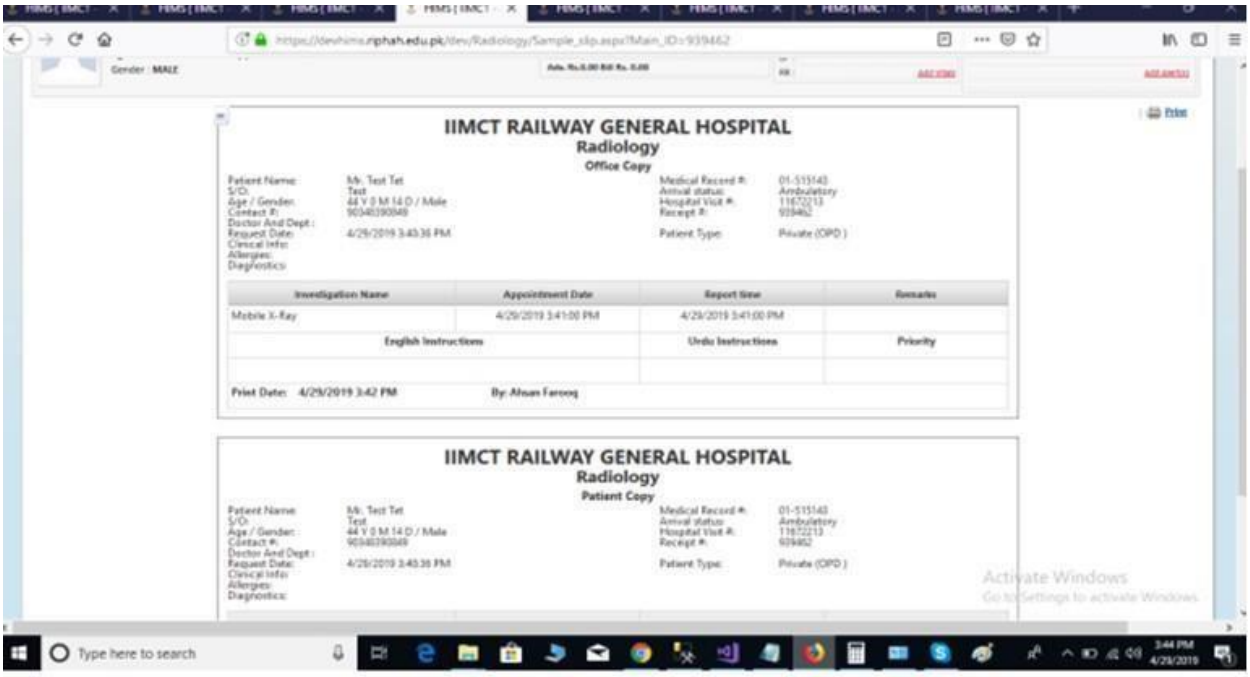
The existing system of the IIMCT Railway Hospital and Riphah General Hospital is almost manual. Conventional pens and paper are used here in the hospital. The large and bulky paper registers, cash memos, receipt books, ledgers, etc. are used for writing or storing the data and information about the different transactions dealt with by the hospital (Haq *et al.*, 2022). This chapter will discuss the existing system running in the hospital and also describe the proposed system so that we can have a clear view of where we are heading.

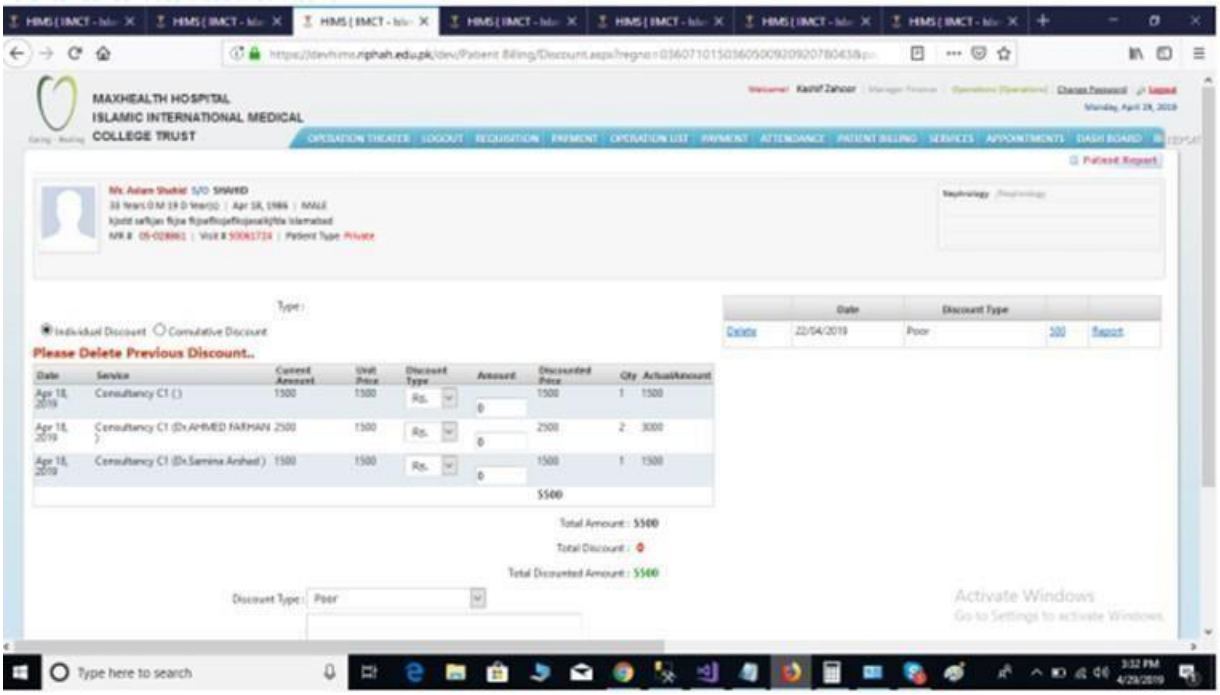
2.1 Introduction to the existing system

Several modules have been given to different module operator heads that have been entering the data in the system, respectively, for their domain. We have practiced the following modules, identified issues, and suggested ways to improve the system, which have been highly appreciated by the management. Following are the details:

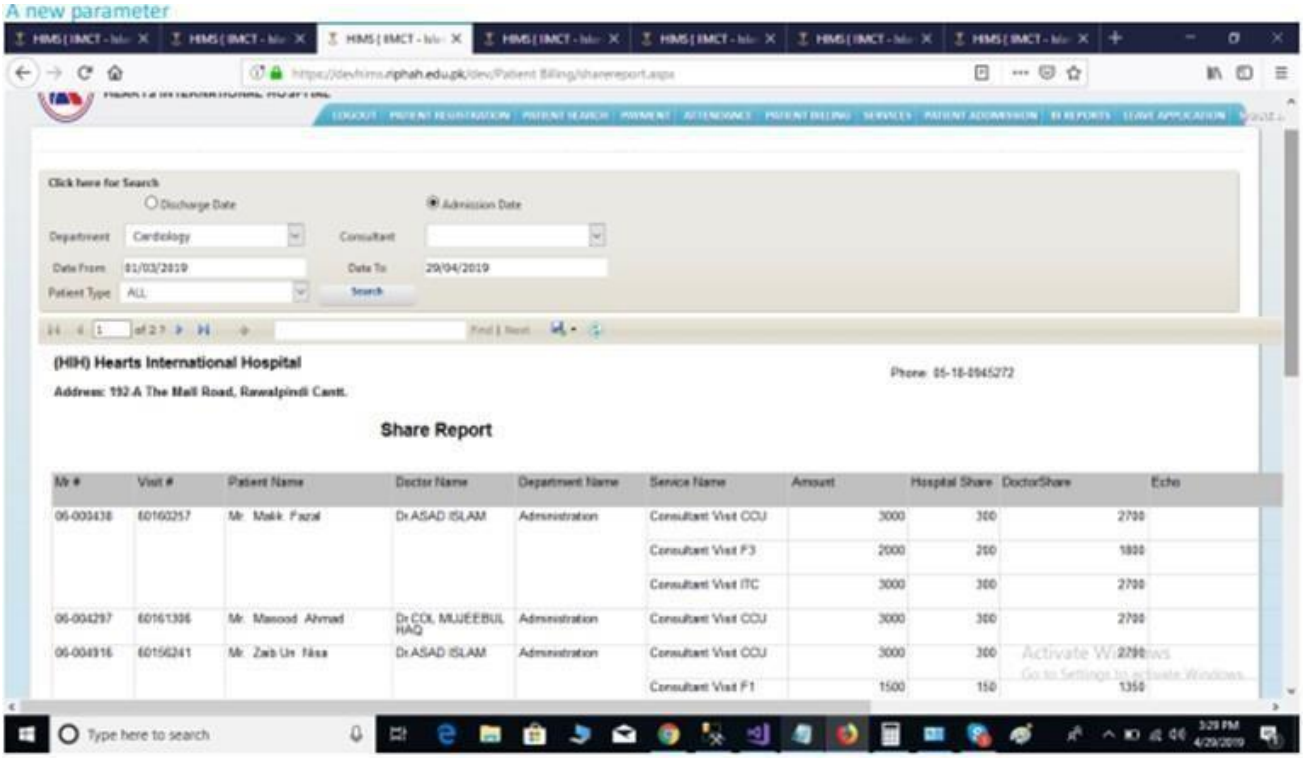
2.1.1 Radiology Module

There is no segregation of X-ray reports and other scans with respective MR numbers assigned to different patients. The operator of the module must go through each test report to find the respective scan that is required by the doctor or patient. It increases the load of patient handling and is a repetitive exercise. It could be improved if a column was added in the field that tells the details of the test, e.g., X-ray, CT scan, etc.

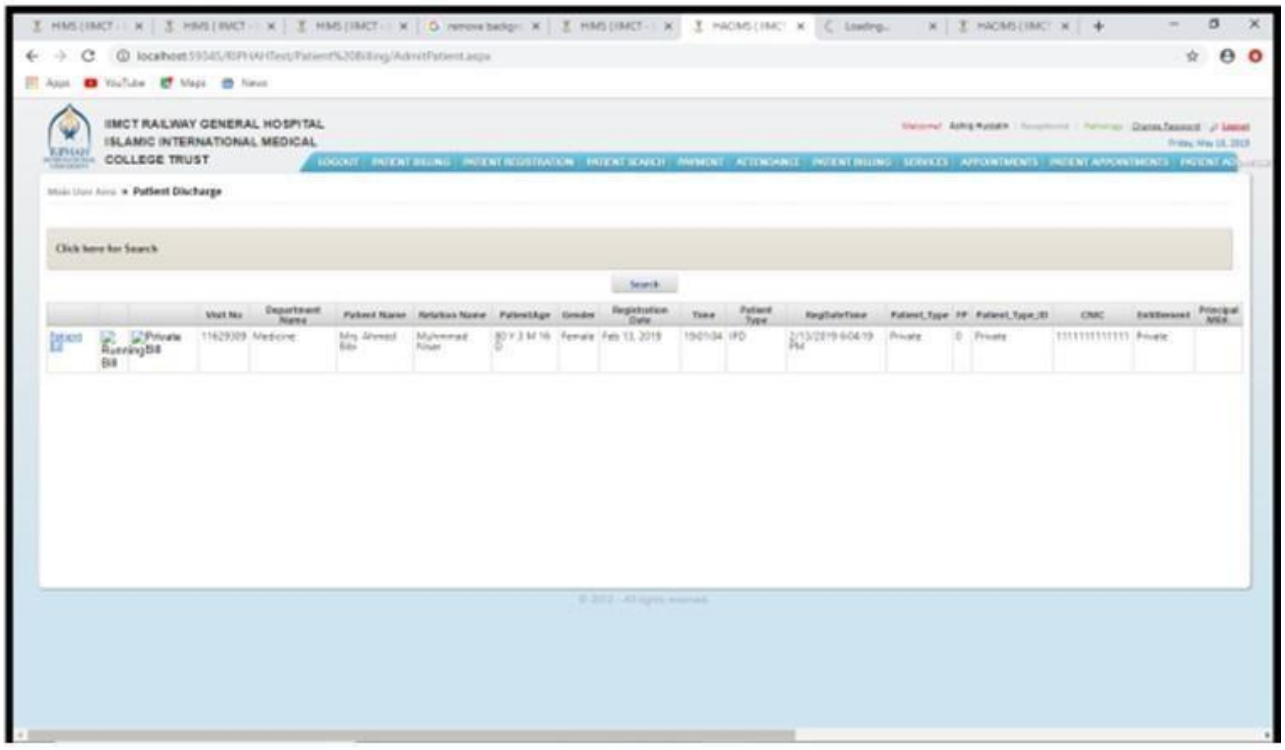

IIMCT RAILWAY GENERAL HOSPITAL
Radiology
Office Copy
Patient Name: Mr. Test Tet
S/O: Test
Age / Gender: 44 Y 0 M 14 D / Male
Contact #: 9034839049
Doctor And Dept :
Request Date: 4/29/2019 3:40:38 PM
Clinical Info:
Allergies:
Diagnostics:
Medical Record #: 01-515143
Arrival status: Ambulatory
Hospital Visit #: 11672213
Receipt #: 939462
Patient Type: Private (OPD)
Investigation Name
Appointment Date
Report time
Remarks
Mobile X-Ray
4/29/2019 3:41:00 PM
4/29/2019 3:41:00 PM
English Instructions
Urdu Instructions
Priority
Print Date: 4/29/2019 3:42 PM
By: Ahsan Farooq
IIMCT RAILWAY GENERAL HOSPITAL
Radiology
Patient Copy
Activate Windows
Type here to search


MAXHEALTH HOSPITAL
ISLAMIC INTERNATIONAL MEDICAL
COLLEGE TRUST
Individual Discount
Cumulative Discount
Please Delete Previous Discount..
Date
Service
Current Amount
Unit Price
Discount Type
Amount
Discounted Price
Qty
ActualAmount
Total Amount : 5500
Total Discount : 0
Total Discounted Amount : 5500
Discount Type : Poor
Activate Windows
Type here to search

A new parameter



Provisional Bill Link



2.1.2 Nursing Module ->

The allocation of patients is segregated. The matron has aggregated the data of all the wards of different specialties into one interface. For example, the main ward nursing station has data on patients admitted in surgery as well as in ICU, which is not required by the nurse. An area for improvement is if the module is designed in such a way that the main ward nursing station has only details showing occupied and vacant beds in its own respective area. Also, the data was not segregated gender-wise, but the allocation of patients in wards is otherwise.

- A female ward nursing station's data has nothing to do with the male ward nursing station, and vice versa.

Duplication of name alert: patient wasn't present. It has been advised that the system should automatically pop up an alert for such instances.

2.1.3 Doctors Module ->

This module is being run and addressed by a medical representative who, in someinstances, is a specialist. The doctor must enter details about the patient in the system himself andwhile checking up. This increases the waiting time per patient. Also, the system generated multiplereceipts for the patients at one time. For example, if the patient must visit two doctors with different specialties, the system generates receipts that sometimes coincide with each other. The Joint Commission International Standards advises 4Ps for doctors.

1. Predictive.
2. Preventive.
3. Personalized.
4. Participative.

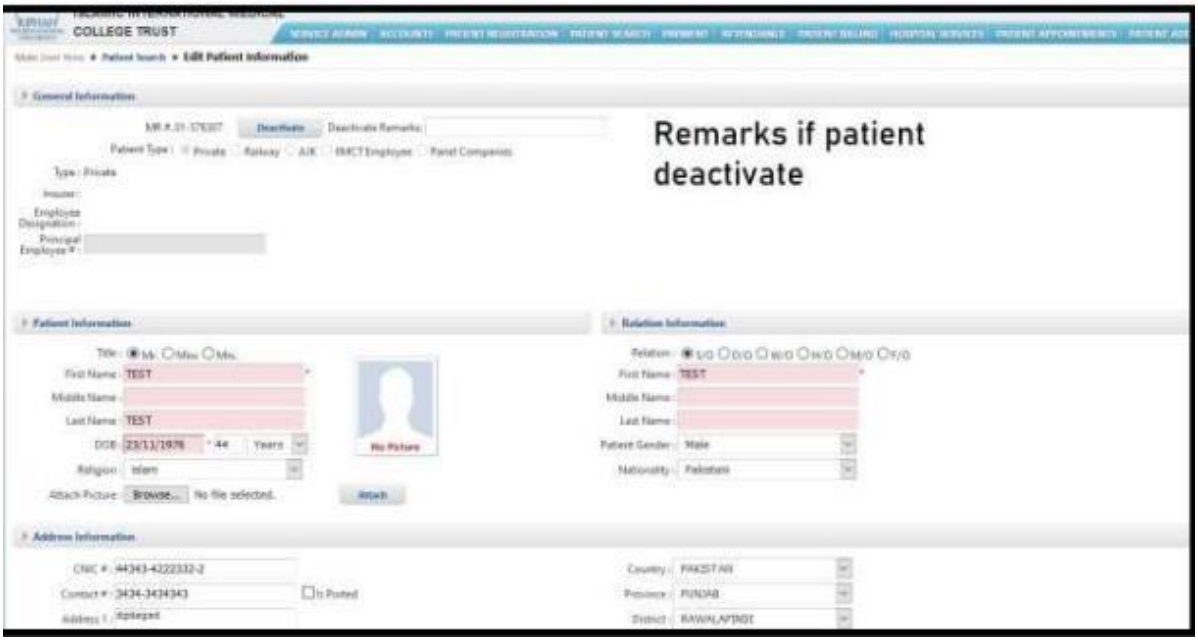
We have suggested that multiple receipts should not be generated by the registration person and cyclic procedure is to be followed.

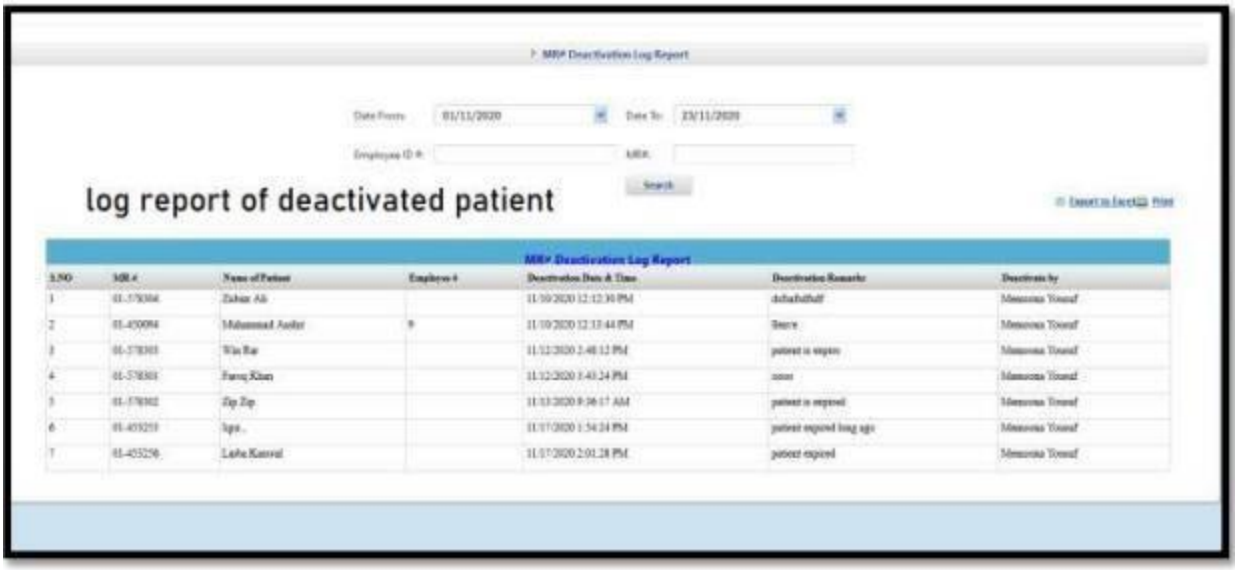
2.1.4 Registration Module ->

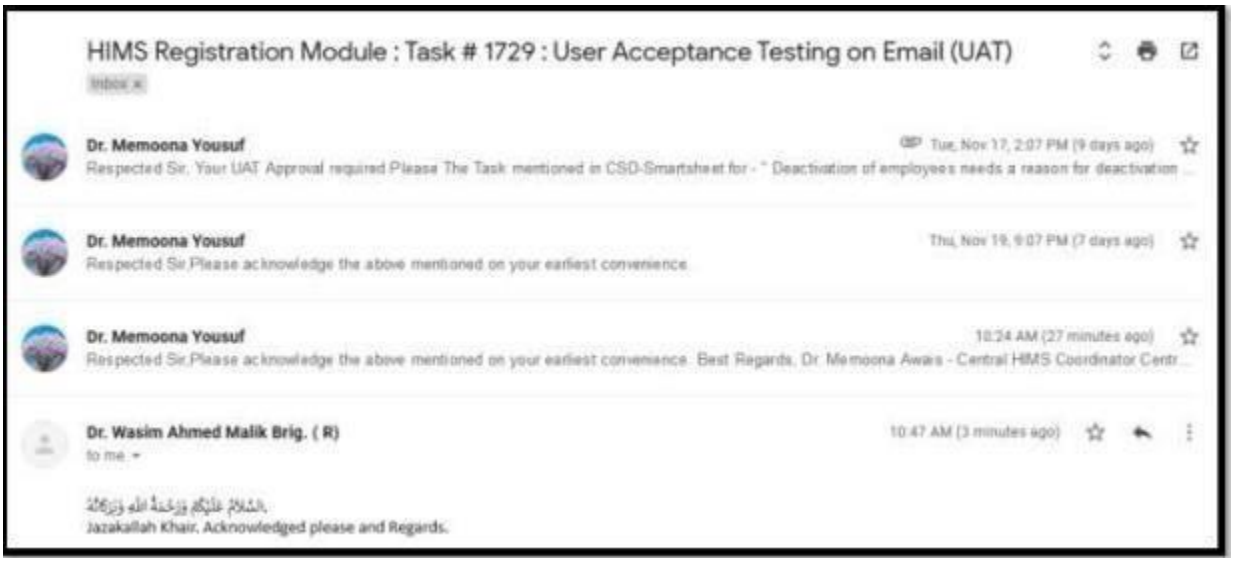
The number of patients is large. Daily, around 600+ patients visit. Emergency services aren't generated without the patient's CNIC. Also, the software seems to work slowly at times,

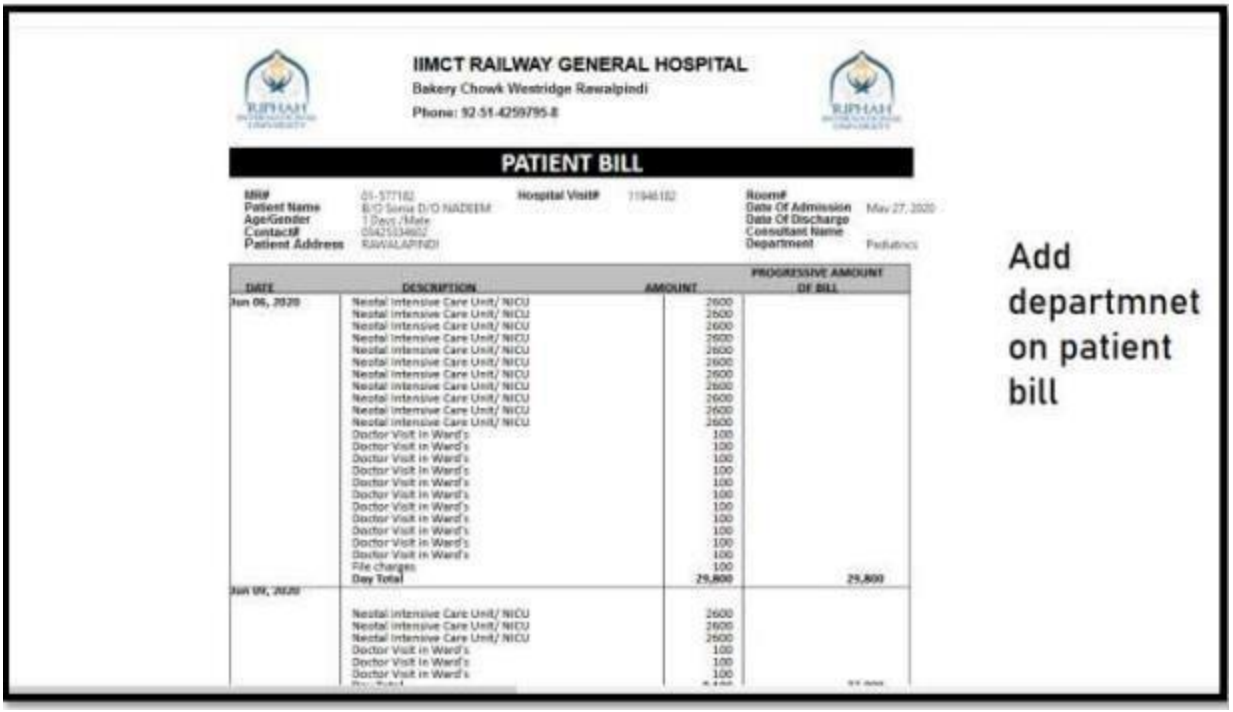
which increases the operating time per patient. Sometimes the data is not transferred accurately to the next step. The operator must re-run the process to correct such an instance. The system doesn't generate a slip if CNIC is not present. Suggestions to proceed without CNIC in certain instances should be allowed if the patient is serious or otherwise in non-neglectable scenarios.

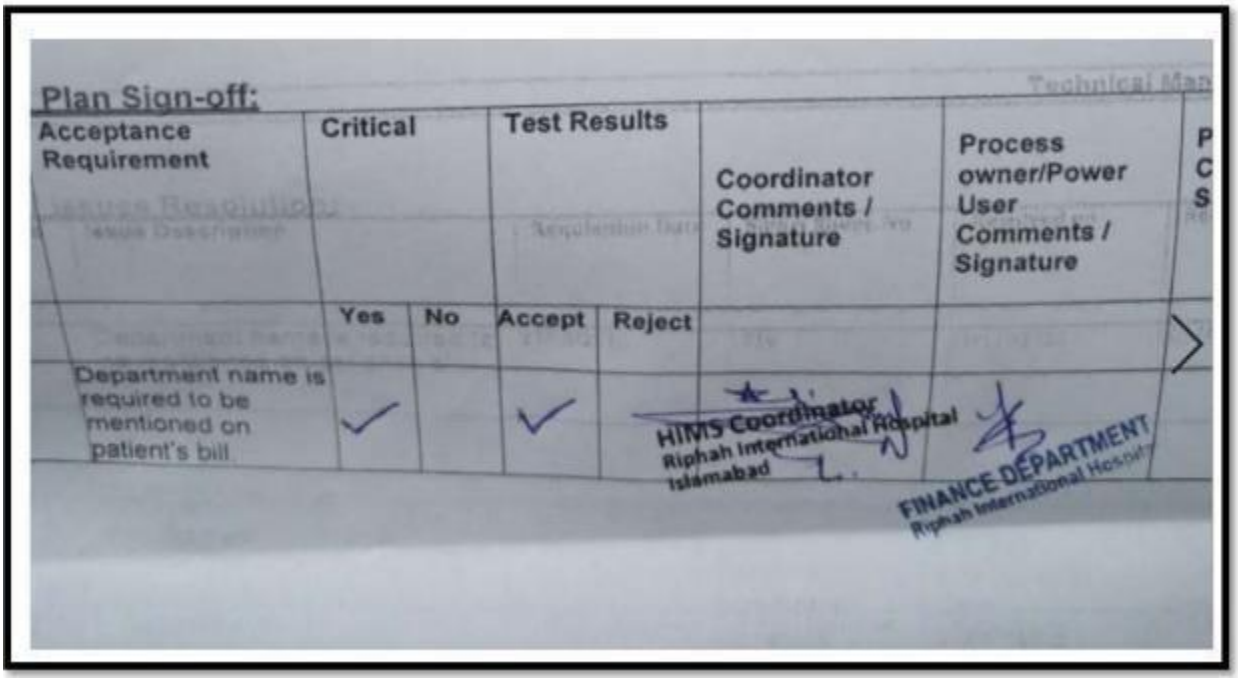
Task ID	Task Detail	Hospital	Module	Request By	Request Type
1	As per user requirement, Remarks/Reason column is added in edit page of patient registration, so no one can deactivate the patient without enter the reason. A new report that is "MR# Deactivation Log Report" is also developed.	PRH	Patient Registration	Dr. Memoona	New Development
2	As per user requirement, patient department name is added in the header of running bill and in final bill.	RIH	Patient Billing	Mr. Imran Shahid	Customization




log report of deactivated patient


HIMS Registration Module : Task # 1729 : User Acceptance Testing on Email (UAT)
Dr. Memoona Yousuf
Tue, Nov 17, 2:07 PM (9 days ago)
Respected Sir, Your UAT Approval required Please The Task mentioned in CSD-Smartsheet for - " Deactivation of employees needs a reason for deactivation ...
Dr. Memoona Yousuf
Thu, Nov 19, 9:07 PM (7 days ago)
Respected Sir,Please acknowledge the above mentioned on your earliest convenience.
Dr. Memoona Yousuf
10:24 AM (27 minutes ago)
Respected Sir,Please acknowledge the above mentioned on your earliest convenience. Best Regards, Dr. Memoona Awais - Central HIMS Coordinator Centr...
Dr. Wasim Ahmed Malik Brig. (R)
10:47 AM (3 minutes ago)
to me
السلام عليكم ورحمة الله وبركاته
Jazakallah Khair. Acknowledged please and Regards.





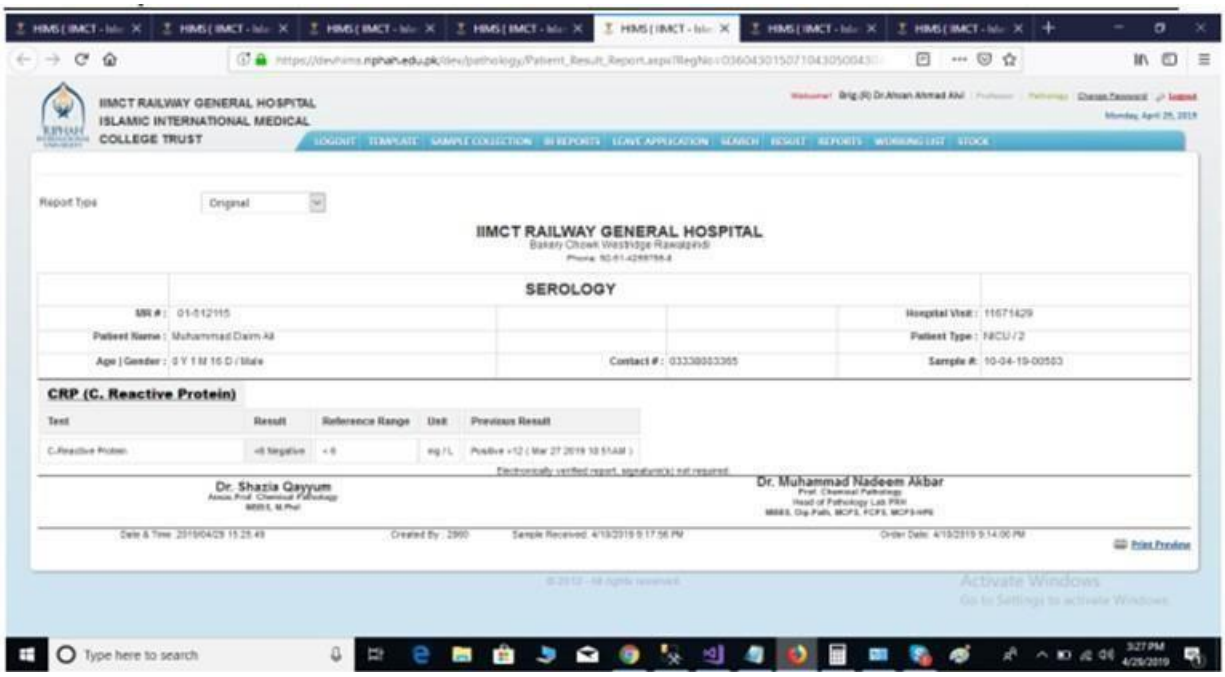
2.1.5 Pathology Module ->

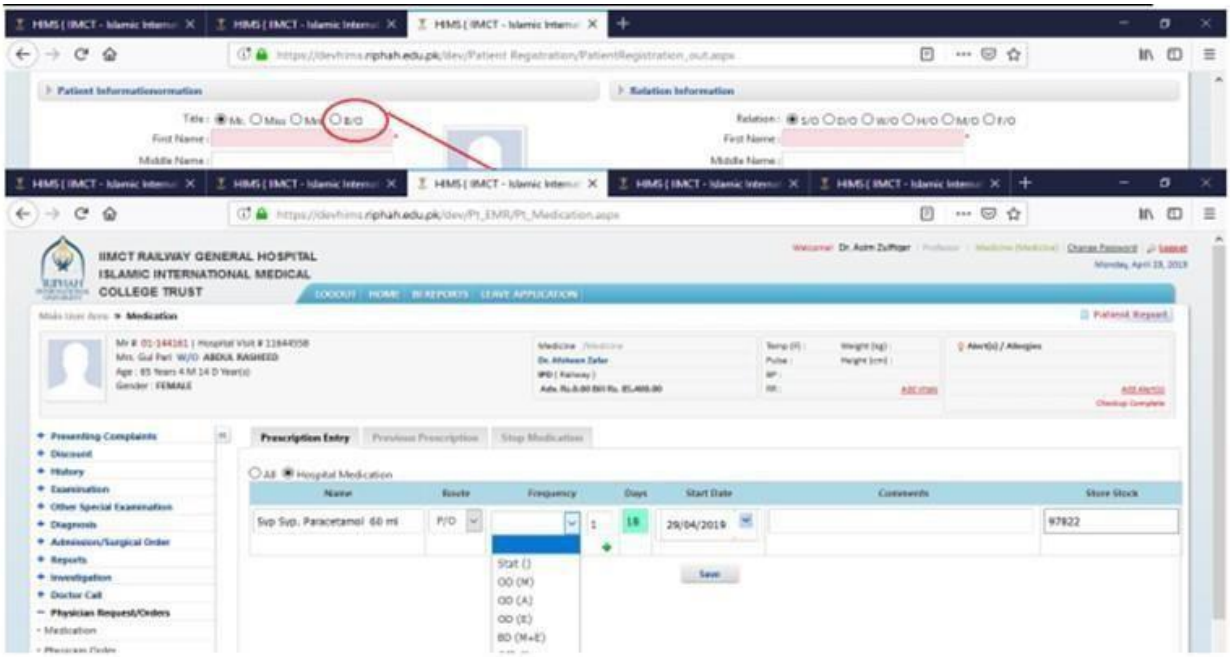
This module doesn't incorporate details of patients according to their type, for example, if the patient has been introduced by an insurance company, a Sehat Card, or cash. It has been advised that such a category be introduced in the module to incorporate such segregation. Also, the format

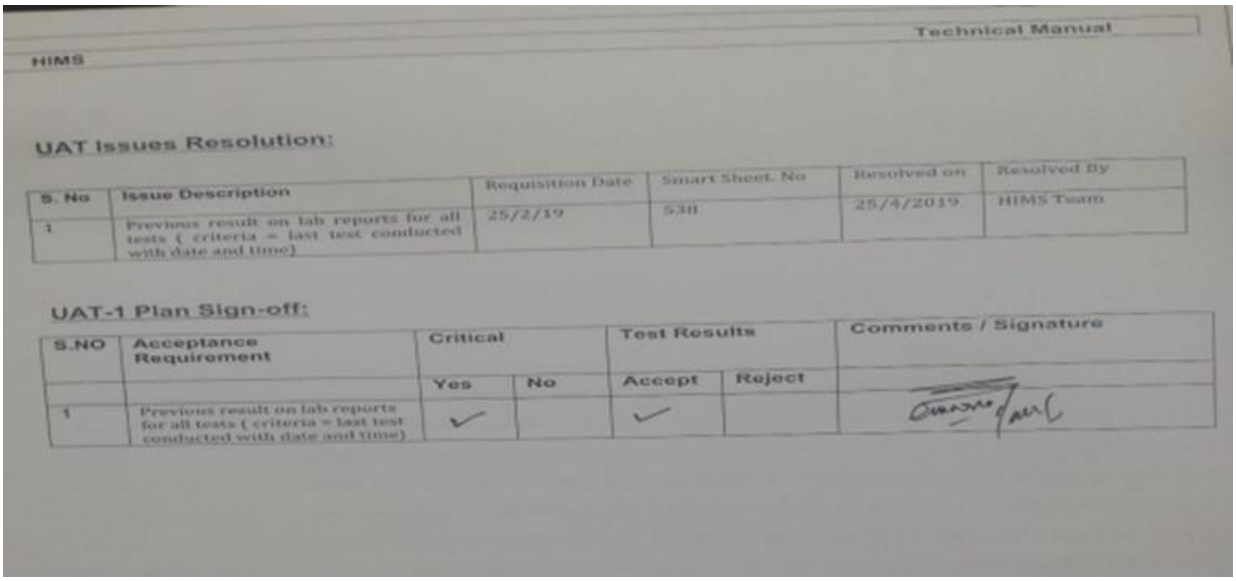
of the reports is not as per the original format; for example, bullet points have been printed on the report in a horizontal direction instead of pointwise. Report format upgrade has been requested. Also, another point has been emphasized: the system should be machine-integrated instead of the lab attendant mentioning the results to avoid human error.

6.1 Resolved Bugs

Lab turned around report does not show data according to the given date parameters. This error is removed by the correction of query of this report.







HIMS

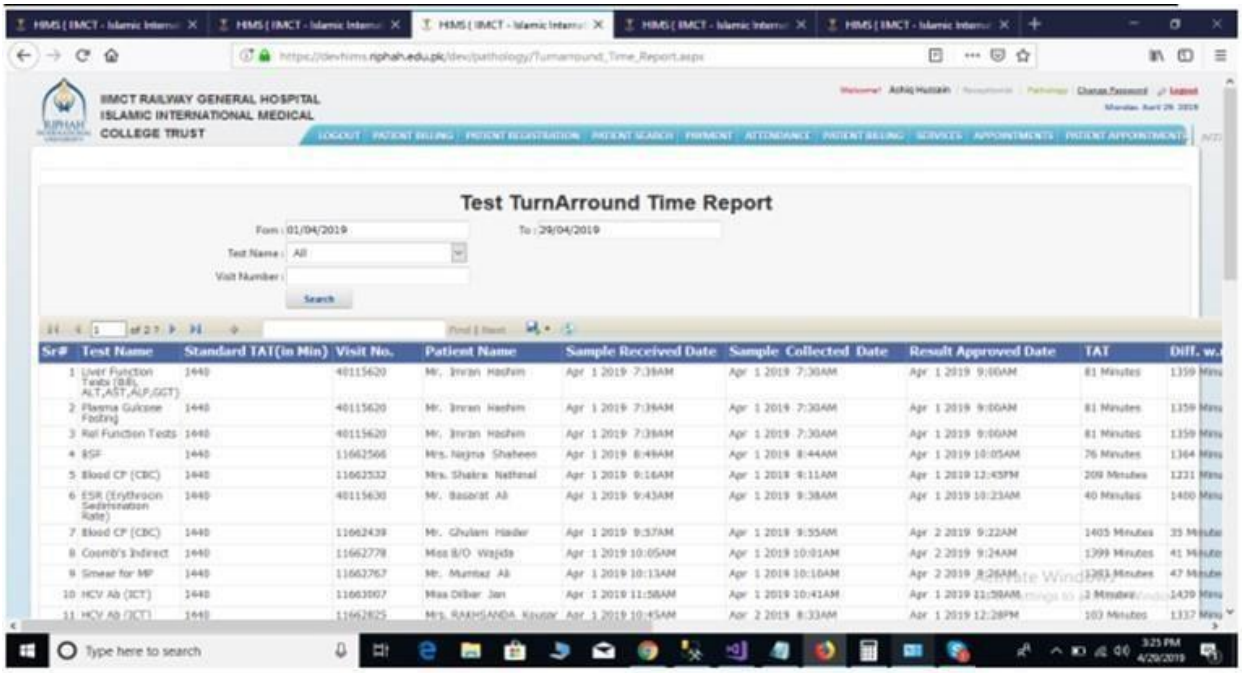
Technical Manual

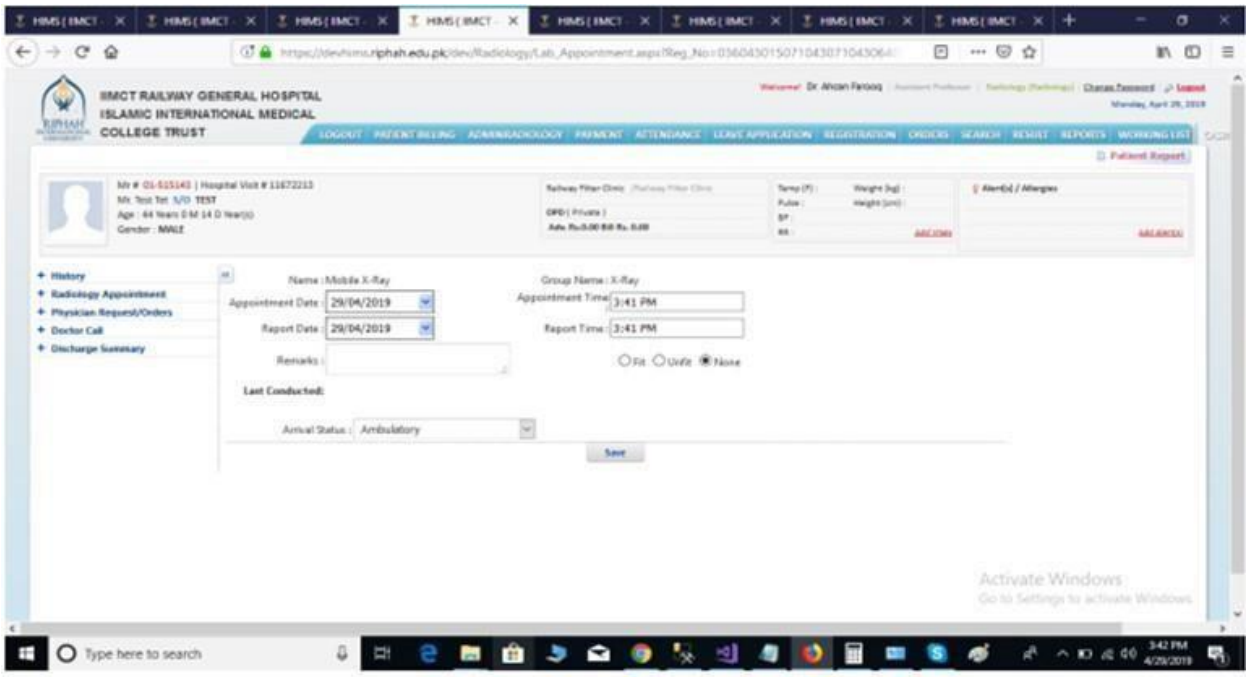
UAT Issues Resolution:

S. No	Issue Description	Requisition Date	Smart Sheet. No	Resolved on	Resolved By
1	Previous result on lab reports for all tests (criteria = last test conducted with date and time)	25/2/19	538	25/4/2019	HIMS Team

UAT-1 Plan Sign-off:

S.NO	Acceptance Requirement	Critical		Test Results		Comments / Signature
		Yes	No	Accept	Reject	
1	Previous result on lab reports for all tests (criteria = last test conducted with date and time)	✓		✓		





2.2 Need of computerization

The HMIS solution is already implemented in the hospital and is in working condition. However, some improvements and upgrades in the processes have been conveyed to the

management for suggestive changes. Those have been appreciated. Examples of such suggestions are as follows:

- Remove the mandatory requirement for CNIC for the registration process as patients in emergencies or other genuine users aren't entered in the system timely upon arrival at the hospital.
- For doctors' modules, quick search criteria need to be implemented, as the doctor needs to check the entire list of tests to select one. The search criteria should be efficient and relevant to the doctor's field.
- Nursing modules need to be ward-specific with gender segregation. The data needs to be specific to the ward.
- Radiology and pathology can both be accumulated into one module with subcategories for clinical pathology, x-ray scans, etc.

2.3 Introduction to the proposed system

The existing system of the *Ripah IIMCT-Pakistan Railway Hospital* has been studied and analyzed in depth. So many problems have been found in the old system of the *Ripah IIMCT-Pakistan Railway Hospital*. These problems and shortcomings have been discussed earlier in detail. The proposed system has been designed to meet the demands and requirements of management in order to increase the productivity, reliability, and efficiency of the *Ripah IIMCT-Pakistan Railway Hospital.*

2.4 Objectives of the proposed system

The foremost and the basic principle in the development of any successful software, is to fulfill the end-user requirements, primarily. Second important principle is that, the software must be able to provide the management with accurate, precise and timely information for the decision-making purposes. Third important principle is that software must be designed keeping the future requirement in mind. Finally, the software must be user-friendly.

Now the proposed system of the *Ripah IIMCT- Pakistan Railway Hospital* would be designed so that, it would meet the end-user requirements, provide the management with accurate and timely information for the decision-making. Furthermore, the proposed system would be user-friendly

and able to meet the future requirements. Some of the major features, considered for the proposed system are being given below: This proposed information system would relieve the staff of receplion, laboratory and pharmacy, etc., from doing the excessive paper work and the book keeping. This information system would automatically manipulate the patients' records by generating and assigning a unique patienl registralion numbers to the patients. Then, remaining operations would be performed against the given patienl registration number. Reports of different medical tests would be generated and printed automatically. The discharge report would be generated automatically, by collecting the data and information from various database tables.

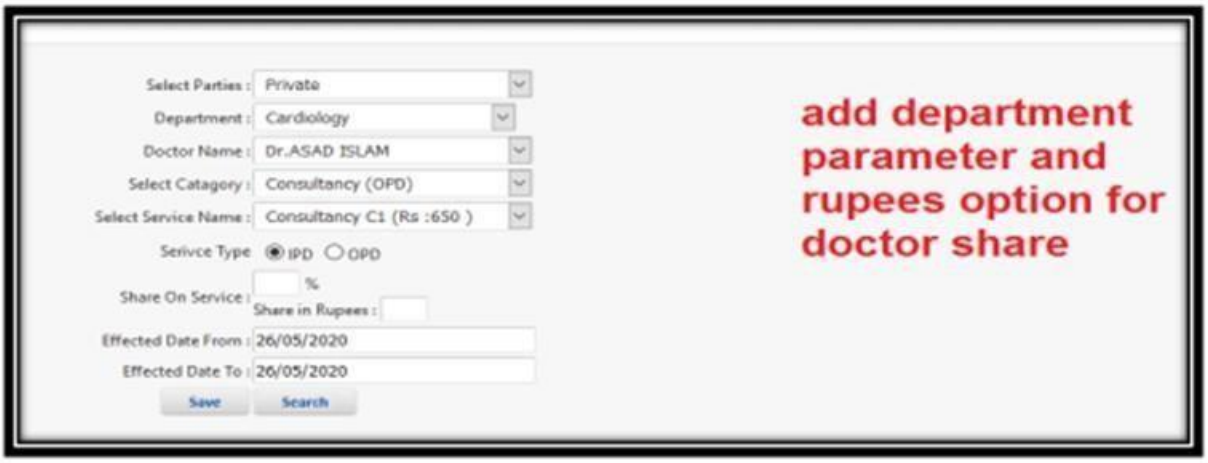
The proposed information system would facilitate the end-user with a variety of information about the patients, the medical tests, the reports, the medicine purchases, the medicine sales, the stock level, the laboratory and the doctors, as well. The proposed information system would implement real rules and regulations of the *Ripah IIMCT- Pakistan Railway Hospital* regarding various categories of the patients. Furthermore, the proposed information system of the *Ripah IIMCT- Pakistan Railway Hospital* would provide a powerful security to the useful data.

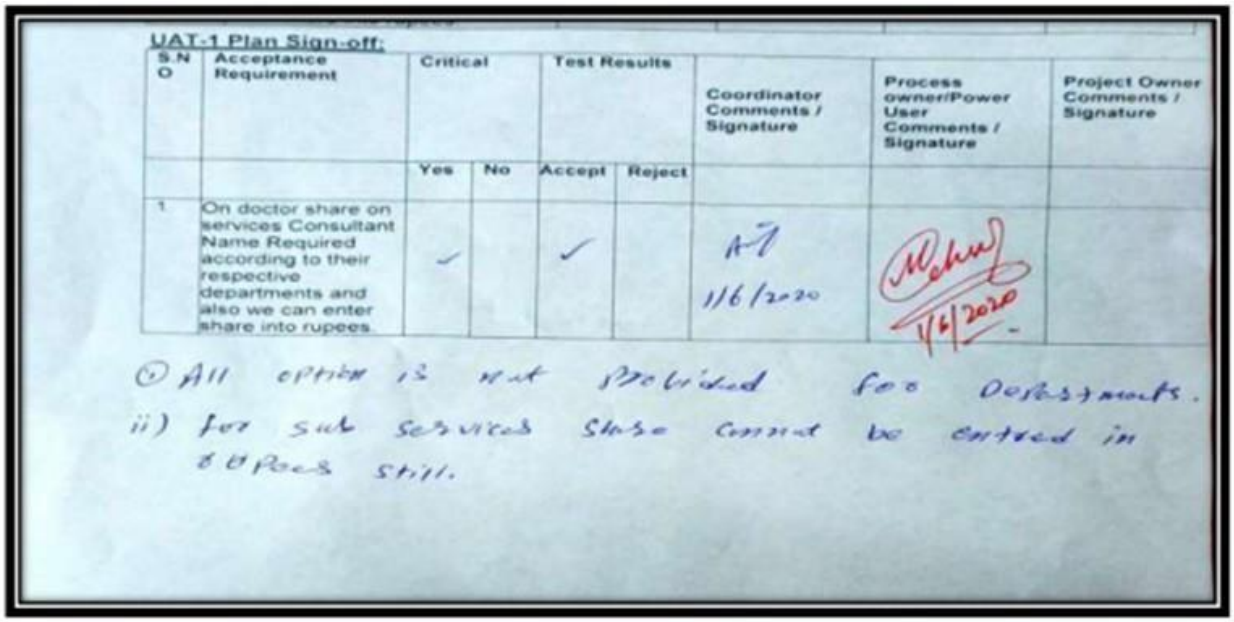
2.5 Proposed solution

The new proposed information system would provide the user with a beautiful and user-friendly interface. This information system would be quite user- friendly by providing guidelines, tips and help at the various levels. With reference to doctor’s module following attached picture has been proposed to the management,

Show reply of call on doctor dashboard

Task # 1431, 1432 : User Acceptance Testing on Email
Dr. Memoona Yousuf
12:25 PM (9 minutes ago)
Respected Sir, The Task mentioned in CSD-Smartsheet for - "Remarks" filed in History tab to be fetched in Discharge Summary against th...
Dr. Muhammad Asad
12:29 PM (6 minutes ago)
to me, Wasim, HIMS, Siddiq, Ahmed, Omer
Approved and thank u
regards
Asad


Select Parties : Private
Department : Cardiology
Doctor Name : Dr.ASAD ISLAM
Select Catagory : Consultancy (OPD)
Select Service Name : Consultancy C1 (Rs :650)
Serivce Type IPD OPD
Share On Service : %
Share in Rupees :
Effected Date From : 26/05/2020
Effected Date To : 26/05/2020
Save
Search
add department parameter and rupees option for doctor share

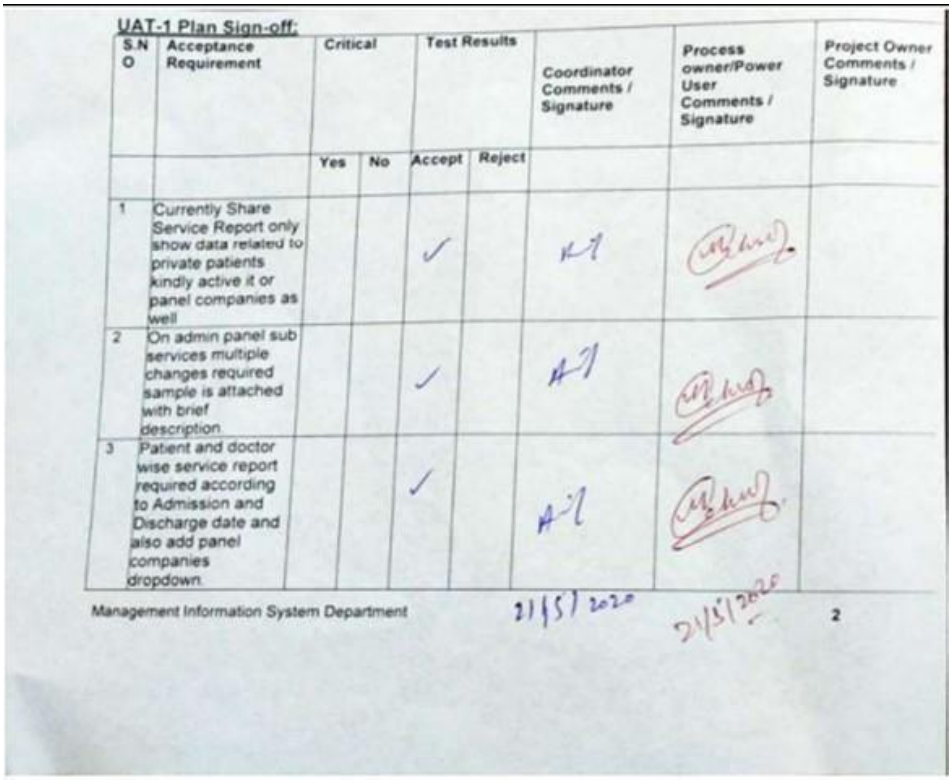


UAT-1 Plan Sign-off:

S.NO	Acceptance Requirement	Critical		Test Results		Coordinator Comments / Signature	Process owner/Power User Comments / Signature	Project Owner Comments / Signature
		Yes	No	Accept	Reject			
1	On doctor share on services Consultant Name Required according to their respective departments and also we can enter share into rupees	✓		✓		1/6/2020	1/6/2020	

(i) All option is not provided for Departments.
ii) for sub services share cannot be entered in rupees still.

1462- All Subservices



UAT-1 Plan Sign-off:

S.NO	Acceptance Requirement	Critical		Test Results		Coordinator Comments / Signature	Process owner/Power User Comments / Signature	Project Owner Comments / Signature
		Yes	No	Accept	Reject			
1	Currently Share Service Report only show data related to private patients kindly active it or panel companies as well			✓				
2	On admin panel sub services multiple changes required sample is attached with brief description			✓				
3	Patient and doctor wise service report required according to Admission and Discharge date and also add panel companies dropdown			✓				

Management Information System Department 21/5/2020 21/5/2020 2

2.6 Salient features of the proposed system

The proposed information system would have certain qualities and characteristics in order to achieve the required objectives, which are as follows:

HIMS release 5.5 covers the new features and changes (based on approved requirements) to facilitate the users execution of clinical, administrative, and financial activities. This release will provide benefits to MaxHealth Hospital, RIPHAH International Hospital, Islamic International Dental Hospital, IIMCT Pakistan Railway Hospital, and Heart International Hospital.

1. As per the user statement, the user added every new diagnosis in ICD10 without a serial number, like NE00. Now, as per the user requirement, the user can add new diagnoses with a serial number, like NE01, NE02, etc.
2. In the doctor module, a physician can write his remarks at the time of writing the patient history; now, as per user requirement, these remarks will be fetched in the discharge summary if the doctor writes his remarks in the patient history.

3. In the doctor module, if a doctor wants to discuss any matter regarding a patient, he can call any doctor of the hospital through the system, but he cannot get a reply from that doctor through the system. Now, as per user requirement, the reply of the second doctor will be received through the system.
4. As per user requirement, the following three issues have been resolved regarding the share service report:

    - The "All" option is added to the department drop-down list.
    - The "Panel Companies" option is added to the patient type drop-down list.
    - A new drop-down list, "Select Panel," is added, which will be filled with panel companies if the user selects the "Panel Companies" option from the patient type drop-down list.

5. As per user requirement, the following two issues have been resolved regarding doctor share parameters:

    - A new drop-down list, "Department," is added. By adding this parameter, the drop-down list of "Doctor Name" will be filled with only those doctor names that belong to the above-selected department.
    - A new text box, "Share in Rupees," has been added. Now users can also add the doctor's share of service in rupees. 6. As per user requirement, the following two issues are resolved regarding the "Patients and Doctor Services" report:
    - As two new parameters, two new radio buttons, "Admission Date" and "Discharge Date," are added.
    - A new drop-down list, "Select Panel," is added, which will be filled with panel companies if the user selects the "Panel Companies" option from the patient type drop-down list.

6. As per user requirement, the following three issues are resolved regarding "Admin Panel Sub Services."

    - The "Panel Companies" option is added to the patient type drop-down list.

- A new drop-down list, "Select Panel," is added, which will be filled with panel companies if the user selects the "Panel Companies" option from the patient type drop-down list.
- A new function is added so that the user can add all subservices against one selected "service category."

2.7 Compatibility features of hmis:

This product has been tested on the following platforms or with the following products:

1. Asp.NET (Vb, C#)
2. SQL server 2012
3. Browser (Chrome).
4. Browser Firefox
5. HIMS Database
6. Windows:8.1,10,11, Smart Phones and Smart Tablets.

2.7.1 Functions: -

Smart. Sheet. Id	Function Name	Description
1430	Addition of New Diagnosis	As per user statement, user add every new diagnosis in ICD10 diagnosis without serial number like NE00, now as per user requirement user can add new diagnosis with serial number like NE01, NE02 etc.
1431	Doctor Remarks in History	In doctor module, a physician can write his remarks at the time of writing the patient history, now as per user requirement, these remarks will be fetched in discharge summary, if doctor writes his remark in patient history.
1432	Doctor Reply	In doctor module, if a doctor wants to discuss any matter regarding patient then he can call any doctor of hospital through system, but he cannot get reply of that doctor through system, now as per user requirement, reply of second doctor will be received through system.
1459	Share Service Report	As per user requirement, following three issues are resolved regarding share service report. 1. "All" option is added in department drop-down list. 2. "Panel Companies" option is added in patient type drop-down list. 3. A new drop-down list that is "Select Panel" is added, which will be filled with panel companies list, if user select "Panel Companies" option from the patient type drop-down list.
1460	Doctor Share Parameters	As per user requirement, following two issues are resolved regarding doctor share Parameters 1. A new drop-down list that is "Department" is added, by adding this parameter the drop-down list of "Doctor Name" will be filled with only those doctor names, who will belong to the above selected department. 2. A new text box that is "Share in Rupees" is added, now user can also add doctor share of service in rupees.
1461	New Parameters	As per user requirement, following two issues are resolved regarding "Patients and Doctor Services" report 1. As two new parameters, two new radio buttons that are "Admission Date", "Discharge Date" are added 2. A new drop-down list that is "Select Panel" is added, which will be filled with panel companies list, if user select "Panel Patient" option from the patient type drop-down list.
1462	All Subservices	As per user requirement, following three issues are resolved regarding "Admin Panel Sub Services" 1. "Panel Companies" option is added in patient type drop-down list. 2. A new drop-down list that is "Select Panel" is added, which will be filled with panel companies list, if user select "Panel Companies" option from the patient type drop-down list. 3. A new function is added that is user can add all sub services against one selected "Service Category"

2.7.2 New Features Introduced: -

The following new features appear in this release:

Task ID	Task Detail	Hospital	Module	Request By	Request Type
1	As per user statement, user add every new diagnosis in ICD10 diagnosis without serial number like NE00, now as per user requirement user can add new diagnosis with serial number like NE01, NE02 etc.	PRH	Doctor	Dr. Waseem Malik	Customization
2	In doctor module, a physician can write his remarks at the time of writing the patient history, now as per user requirement, these remarks will be fetched in discharge summary, if doctor writes his remark in patient history.	PRH	Doctor	Dr. Memoona	Customization
3	**In doctor module, if a doctor wants to discuss any matter regarding patient then he can call any doctor of hospital through system, but he cannot get reply of that doctor through system, now as per user requirement, reply of second doctor will be received through system.**	PRH	Doctor	Dr. Memoona	Customization
4	As per user requirement, following three issues are resolved regarding share service report. 1. "All" option is added in department drop-down list. 2. "Panel Companies" option is added in patient type drop-down list. 3. A new drop-down list that is "Select Panel" is added, which will be filled with panel companies list, if user select "Panel Companies" option from the patient type drop-down list.	HIH	Doctor Share Module	Mr. Atif Zahid	Customization
5	As per user requirement, following two issues are resolved regarding doctor share Parameters 1. A new drop-down list that is "Department" is added, by adding this parameter the drop-down list of "Doctor Name" will be filled with only those doctor names, who will belong to the above selected department. 2. A new text box that is "Share in Rupees" is added, now user can also add doctor share of service in rupees.	HIH	Doctor Share Module	Mr. Atif Zahid	Customization
6	As per user requirement, following two issues are resolved regarding "Patients and Doctor Services" report 1. As two new parameters, two new radio buttons that are "Admission Date", "Discharge Date" are added 2. A new drop-down list that is "Select Panel" is added, which will be filled with panel companies list, if user select "Panel Companies" option from the patient type drop-down list.	HIH	Patient Billing	Mr. Atif Zahid	Customization
7	As per user requirement, following three issues are resolved regarding "Admin Panel Sub Services" 1. **"Panel Companies" option is added in patient type drop-down list.** 2. A new drop-down list that is "Select Panel" is added, which will be filled with panel companies list, if user select "Panel Companies" option from the patient type drop-down list. 3. A new function is added that is user can add all sub services against one selected "Service Category"	HIH	Patient Billing	Atif Ahmed	Customization

2.8 Modules of existing solutions: -

Following the are modules of existing solutions,

- Patient Registration Module
- Doctors Module
- Nursing Module

- Radiology and Pathology Module
- Operating Procedures Module
- Accidents & Emergency Module
- Human Resource Management Module
- Finance Module

2.9 Pros and cons of proposed system

A standard HMI is a prefabricated product, in contrast to a custom display solution, which is specially developed for a specific application. As an HMI is prefabricated, the design, range, choice of components, etc. are fixed, and the opportunities for customization are limited with pre-set options to choose from. And the lifetime and updates of standard HMIs are fully controlled by the manufacturer. There are several advantages to choosing a standard HMI solution. One great advantage is that it is already available and ready to be implemented immediately in an application, which will reduce time-to-market. Standard HMIs have been developed and refined over time to meet the customer's needs and therefore offer features with a level of quality that enables a customer to determine whether a specific HMI matches the required overall quality and lifetime of the application.

Certifications for specific application areas such as, e.g., marine are quite often a requirement, and the level of certification differs widely among the HMIs available on the market, from basic CE compliance to conformity with the specifications of highly specialised certification societies. Vendors of HMIs often offer a range of different series of HMIs with different characteristics, e.g., IP classing, which enables customers to reuse existing projects on other types of HMIs from the same vendor with virtually no re-engineering.

Connectivity is an important matter as well. HMIs are usually able to communicate directly with a variety of PLCs and other industrial controllers, and additional cloud connectivity is an increasing trend. With the option to choose an HMI and the opportunity to implement Industry 4.0 and optimise operations further, a customer is one step closer to bridging the gap between OT and IT systems. Most HMI vendors offer standard application software with ready-to-use basic and advanced functionality included. Some of the standard HMI application software packages enable engineers to add user-specific functions, which typically require programming skills.

Table 1: Advantages and disadvantages of new system.

Pros	**Cons**
Out-of-the-box solution	Design is pre-determined
Tested and proven quality	Limited options and customization
Extensive driver list included	Limited branding possibilities
Standard application software	EOL fully controlled by HMI manufacturer
Standard certifications	Fixed choice of operating system
Alternative models available	

2.10 Considerations for propose system

A number of considerations would be kept in mind to achieve the proposed system and its objectives. Some of the outlines that would be kept into the considerations arc being given below:

- The proposed system would have capability to retrieve the information efficiently and accurately, with in no time.
- It would be able to process the data to generate the required the outputs, the results and the reports.
- It would be able to provide the end-user with an absolute database management control.
- It would be able to restrict access to the database as it has significance in this context.
- In order to achieve the above-mentioned objectives, the following aspects have been taken care of.
- Authorized access to the database.
- Optimal compromise between the security and the efficiency.
- Entity integrity and referential integrity.
- Zero redundancy.
- The database tables in the fully normalized form.

2.11 Software selection

The selection of a computer language plays a vital role in the development of a new system. The choice of a computer language depends upon the problems that the current system is facing. Today, the front-end and the back end are considered separately. As far as my proposed information system is concerned, I would like to select ***Oracle*** at the *back end* and ***Developer 2000*** at the front-end. There are some reasons for which I have done so. The Oracle database has the following specialties:

- It is one of the best *relational database management systems* (RDBMS) tools.
- powerful database development tool.
- Efficient security.
- Client-Server facility.
- Centralized database.
- The Developer 2000 provides strong *forms* and *report* designers.

2.12 Modular approach

The proposed system would be designed in modules so that, it would facilitate the modifications and the testing. Each program and module would perform a major function. The advantages of the modular approach arc being given below:

- It increases the readability or the programs.
- It decreases the time required to analyze, design, implement, test, debug and maintain programs.
- It also increases the productivity of the program.
- As far as the organization suggests I will use the *Prototype Model* and I will use *Evolutionary Approach of Prototype Model*.
    - Meets user requirements at early stages
    - Reduces risks and uncertainty
    - Also parallel assessment with existing system would be done easily

2.13 Phases of the proposed system

- The proposed system has three phases, which arc being given below:

2.13.1 The Study Phase

- Identify the problem.
- Define the objectives of the proposed system.
- Study the alternate solutions.
- Select and recommend the most feasible system solution.

2.13.2 The Design Phase

- Identify the functions to be performed and allocate them as manual, equipment or computer program tasks.
- Perform input, output dcsigni1Jg.

2.13.3 The Development Phase

- Development of the computer program .
- Complete system and component testing.

2.14 Project scope

Figure 1: Project Scope Diagram

2.15 Module identification

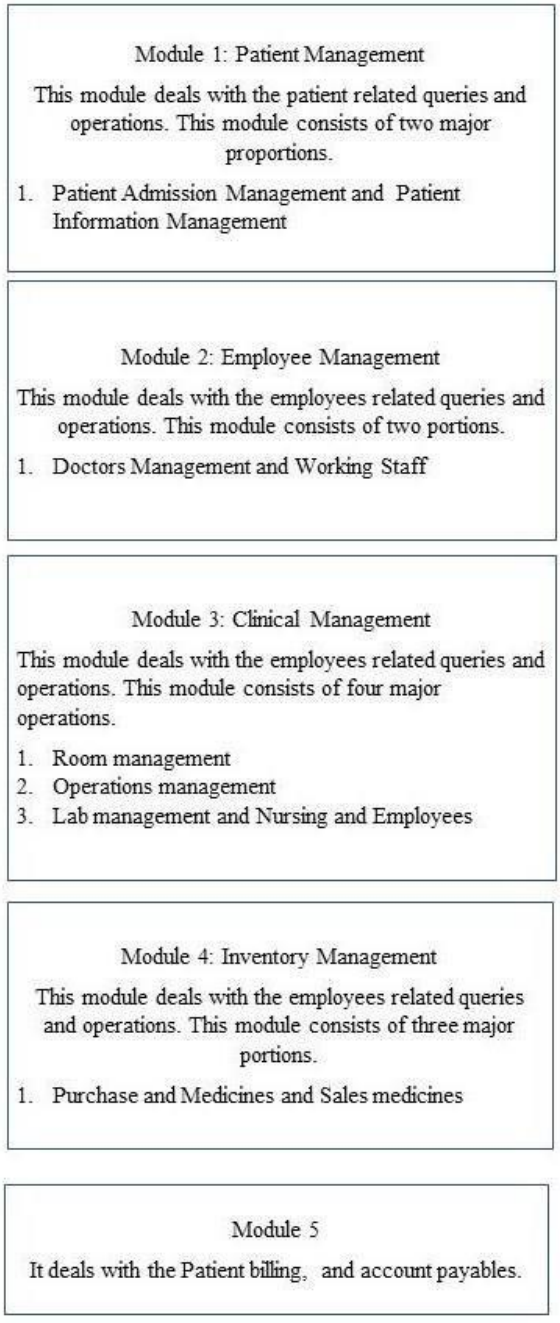


Figure 2: Modules identification

CHAPTER#3

SYSTEM DESIGN

The system design is the phase in which the requirements of the management and the end-user are translated into a well-finished software product. The design includes the details of all the aspects considered and the diagrams of various kinds are also included.

3.1 Introduction to system design

The system design is the phase in which the requirements of the management and the end-user are translated into a well-finished software product. Therefore, the quality of software design has a great impact on software development. The designing of a system (software) is a process through which the requirements are translated into the representation of software. The system analyst must create a conceptual scheme to satisfy the requirements of the end-user, management, and policies of the organization. The system design of a system can be divided into two sub-phases viz., *Logical Design Phase* and *Physical Design*

3.2 Logical database design

This phase simplifies the approach for the large relational database designing by reducing the number of data dependencies, which should be analyzed.

3.2.1 Output Design

The output design constitutes an important part of any information system. The output may be in the form of *reports* and *queries*. The queries are usually screen-oriented whereas the printer usually produces the reports on paper. All of this must be finalized before the file structure is considered. The output of the proposed system is identified as follows:

3.2.1.1 Queries

The proposed information system of the *Riphah IIMCT-Pakistan Railway Hospital* should facilitate the end-user with a variety of queries about the patients, medical tests, reports, medicine purchases, medicine sales, stock level, laboratory, and doctors, as well. The some of the queries required by the *Riphah IIMCT-Pakistan Railway Hospital*.

Hospital management are being given below:

- The queries about different medicine companies.
- The queries about different medicines supplied by different companies.
- The queries about medicine sales.
- The queries about the medicine purchases.
- The queries about the medicine stock level.
- The queries about the available medical tests.
- The queries of different medical tests about different patients.
- The queries about the doctors along with information about them.
- The queries about the patients according to their status e.g., *non-panel, panel, indoors, outdoors* etc.
- The queries about the patients along with the medicines they have been prescribed.
- The queries about the patients along with the doctors, they have consulted.

3.2.1.2 Report Generation

The proposed information system should facilitate the user with a variety of reports about the patients, medical tests, reports, medicine purchases, medicine sales, stock level, laboratory, and doctors as well. Some of the reports required by the *Riphah IIMCT-Pakistan Railway Hospital* management are being given below:

- Reports of different medical tests to be generated and printed automatically.
- The discharge report is to be generated automatically, by collecting the data and information from various database tables.
- The queries about the patients along with a variety of information e.g., doctor, medicines, medical charges, medical test charges, ward charges, operation theater charges etc. and many, many more queries.
- Reports about different medicine companies.
- Reports about different medicines supplied by different companies.
- Reports about the medicine sales.
- Reports about medicine purchases.
- The reports about the medicine stock.

- The reports about the available medical tests.
- Reports of different medical tests about different patients.
- The reports about the doctors along with information about them.
- Reports about the patients according to their status e.g., *non-panel, panel, indoors, outdoors* etc.
- Reports about the patients along with the medicines they have prescribed.
- The reports about the patients along with the doctors, they have consulted.
- The reports about the patients along with a variety of information e.g., doctor, medicines, medical charges, medical test charges, ward charges, operation theater charges etc. and many, many more reports

3.2.2 Input Design

The input design is as important for any information system as the output design. It determines the data that will be used for processing to generate the users' required outputs. Therefore, the inputs must be designed very carefully. The following are the different mechanisms adopted, to make the input design according to the requirements and the demands.

- Main feature of this proposed information system would be that; this information system would collect data/information on spot. In other words, the data/information collection would be performed from the *reception, medical laboratory, pharmacy* etc., at the same time.
- Whenever a patient would come into the *Riphah IIMCT-Pakistan Railway Hospital* to consult a doctor, he would be assigned a *patient registration number*.
- Complete information about the patient would be taken and then stored on the database tables.
- The patient would be registered as a *panel* or *non-panel* and *indoor* or *outdoor*.
- He/she would be referred to a relevant doctor.
- Code numbers would be used in all of the master and detail forms for the data storage and retrieval purposes.
- The code numbers would be used for making the relationships between the master and detail database tables.

- Although the actual names would be used on the form, the concerning code numbers would be stored in the database tables.
- I would try my best to ensure that full information be taken, stored, updated and manipulated so that the end-user may be provided with a vast variety of queries and reports.

3.2.2.1 Code design

A code number is a small combination of characters used to represent a large data item. The proposed information system of the *Riphah IIMCT-Pakistan Railway Hospital* would avail the advantages of the code numbers. There are so many advantages of using the code numbers; some of them are being given below:

- The code numbers are used in the master and detail database tables for making the relationships among them.
- The code numbers save computer storage as compared to the actual data items.
- They reduce the chances of typing mistakes.
- They speed up the data entry processes.
- They are helpful in retrieving large information by using a small code number.
- The proposed information system of *Riphah IIMCT-Pakistan Railway Hospital* would use different code numbers for the different data items e.g., patient registration number, department number, medicine company number, medicine number, doctor number, medical test number etc.

3.2.2.2 Input forms

Various input forms would be designed for the correct, precise, and accurate data entry operations, on the system database. Attempts would be made to design the input forms so that they would have great resemblance to the existing ones. However, new design techniques and methods of computer system technology would also be used to give the latest touch to the forms. Chapter-4 will discuss the total forms of the application and in appendix you can have a clear picture of the interfaces.

3.2.2.3 Choice List

Many choice lists would be provided, whenever a particular field/text item may have one of the given values. The end-user would be required to use the 'LIST' option and select one of them. Then the selected value would be displayed in the corresponding field. This approach would be used to avoid the confusion in data entry operations for the fields, which would have fixed values. Moreover, this approach would also prevent arbitrary words for describing values.

3.2.2.4 Password

The password for the system will be implemented for security purposes. Whenever a user tries to access the information system or the database, he/she would have to provide his/her identification by entering a code word as a password. He/she would be allowed to enter the information system, only if he/she is a valid user.

3.2.2.5 Validation Checks

A larger number of validation checks would be implemented to enforce the rules and regulations of the *Riphah IIMCT-Pakistan Railway Hospital (STRENGTH)l*. Moreover, there are so many reasons due to which these checks would be implemented. Some of the reasons and purposes are being given below:

- To control read, write and updating operations, with the help of locking and unlocking mechanisms.
- Data entry validation checks would be imposed.
- During the data entry and the modification, all other users' access on a single database table would be denied, to prevent the wrong data entry.
- Similar checks would be imposed for the primary key and uniqueness to prevent duplicate records and the non-existing records in the database.

3.3 Physical database design

It is the process of selecting particular data storage structures and accessing the database tables from their paths, in order to achieve better performance.

3.3.1 Table Design

The data in an *Oracle database* is stored in the form of *tables*, which consist of columns or fields. Each column has a particular data type that is decided before the data table is created. The *database tables* would be designed in such a way that they would eliminate data redundancies.They would reduce insert and update anomalies to provide fast retrieval of the information.

3.3.2 Data Type Description

Different computer languages provide different sets of data types and translate or interpret them in their own terminology. Similarly, the *Oracle* provides following set of its data types:

Table 2: Data types.

DATA TYPE	**DESCRIPTION**
CHAR	Used for the Fixed-Length Strings
VARCHAR2	Used for the Variable-Length Strings
NUMBER	Used for the Fixed- and Floating-Point Numeric Data
DATE	Used for the date-type data (having Year, Month, Day and Hour, Minute, Second)
LONG RAW	Used for The Graphics (Bitmaps And Images) up to 2GB
CLOB	Used for the Character Large Objects
BLOB	Used for the Binary Large Objects

3.4 Notations for diagrams

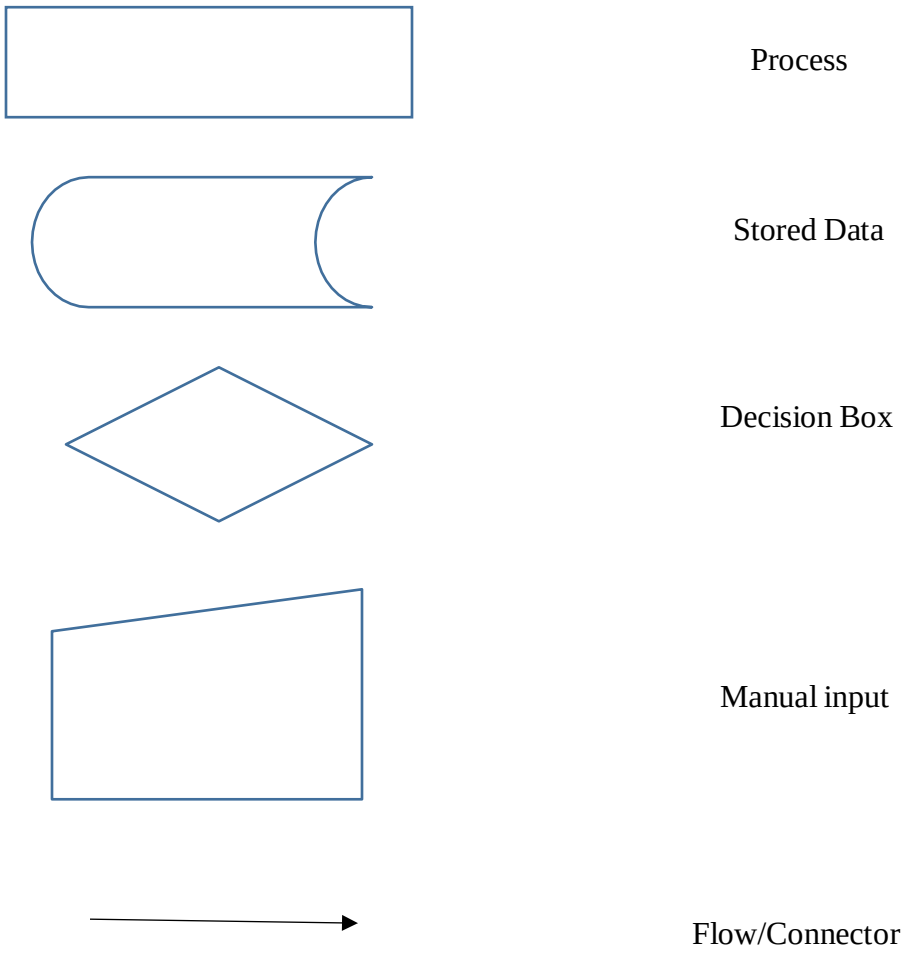


Figure 3: Notations for Diagrams

3.5 Context DFD

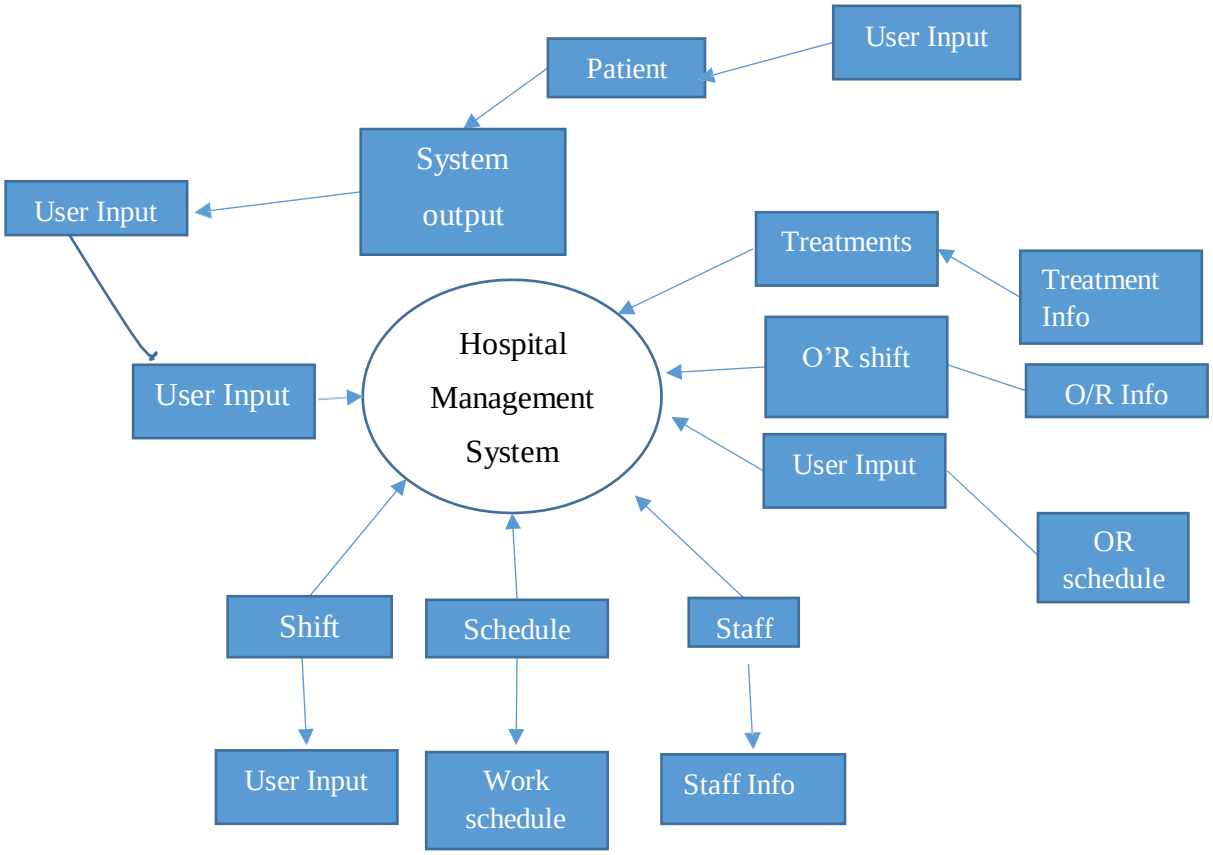


Figure 4: The Context DFD

3.5.1 Context DFD

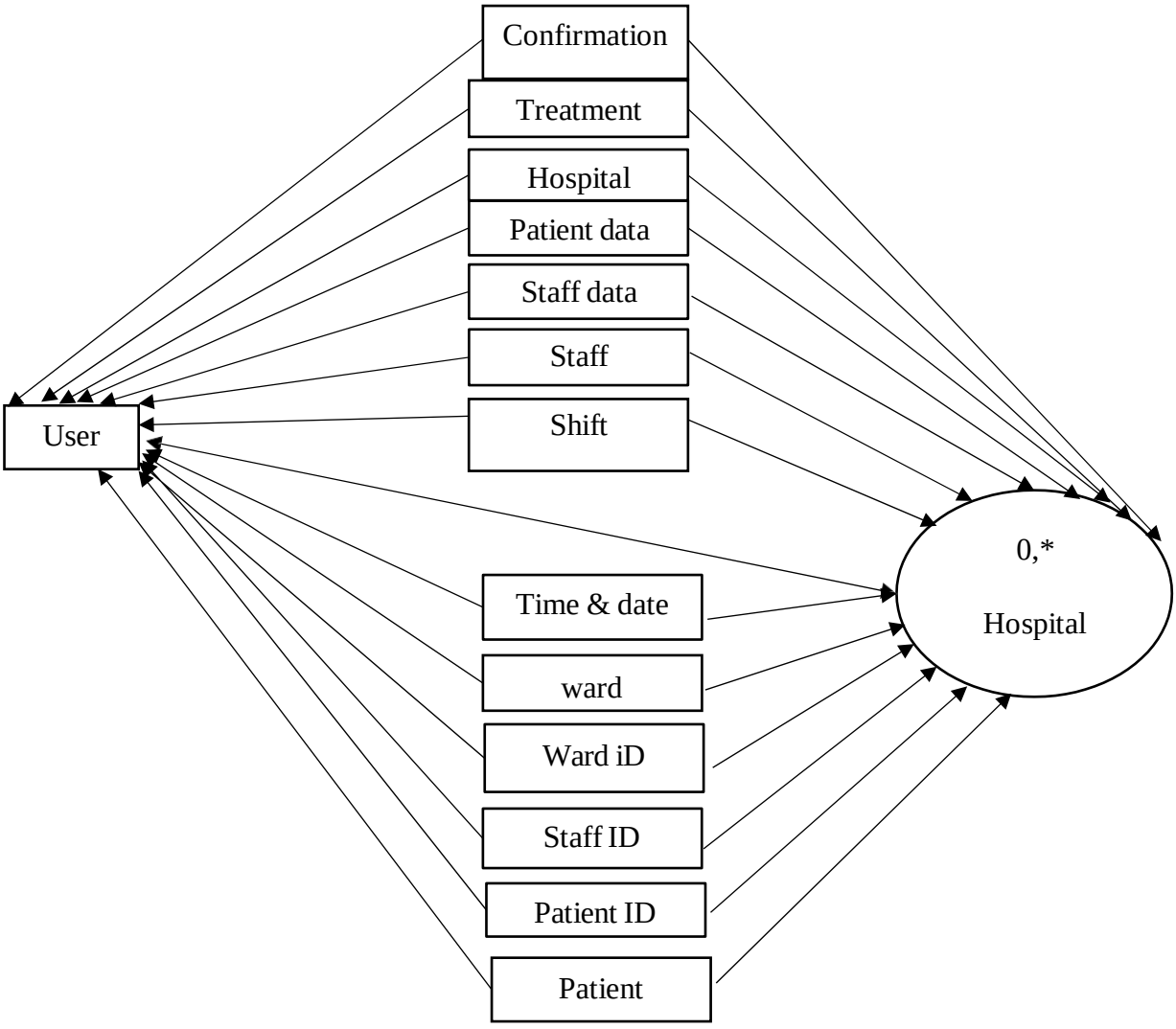


Figure 5: the Context DFD

3.6 Block diagrams

3.6.1 Basic System Block Diagram

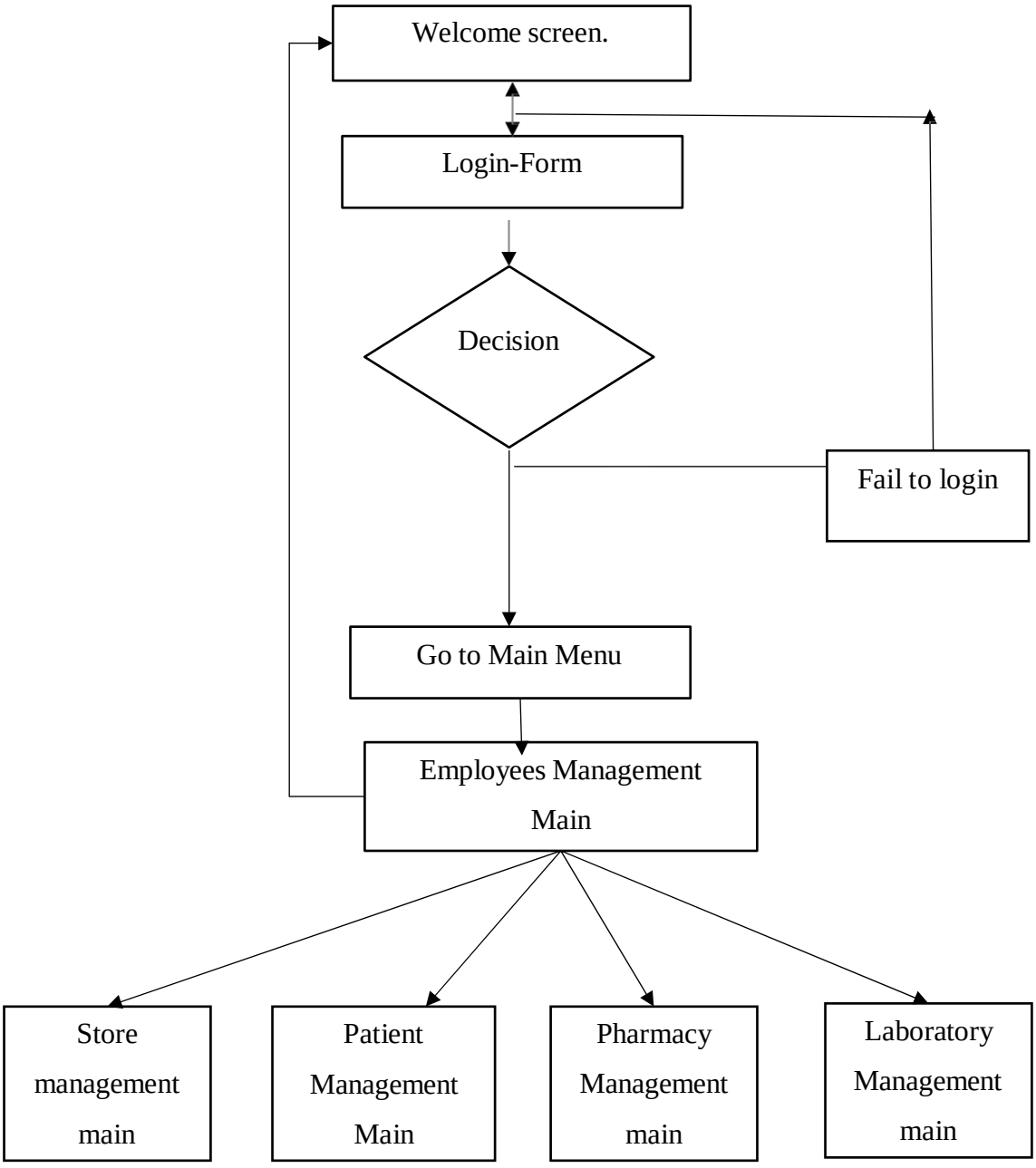


Figure 6: Basic Block Diagram

3.6.2 Employees Management

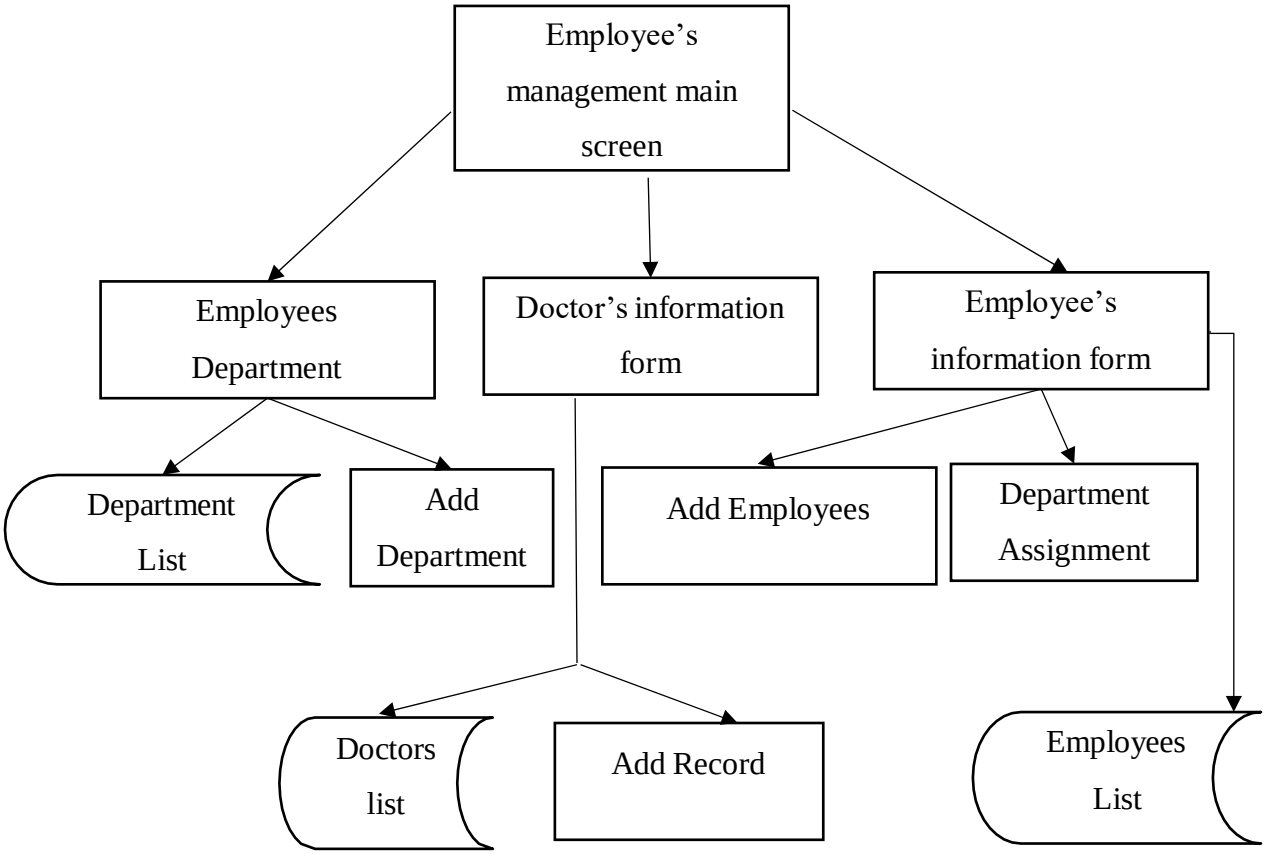


Figure 7: Employees Block Diagram

3.6.3 Patient Management

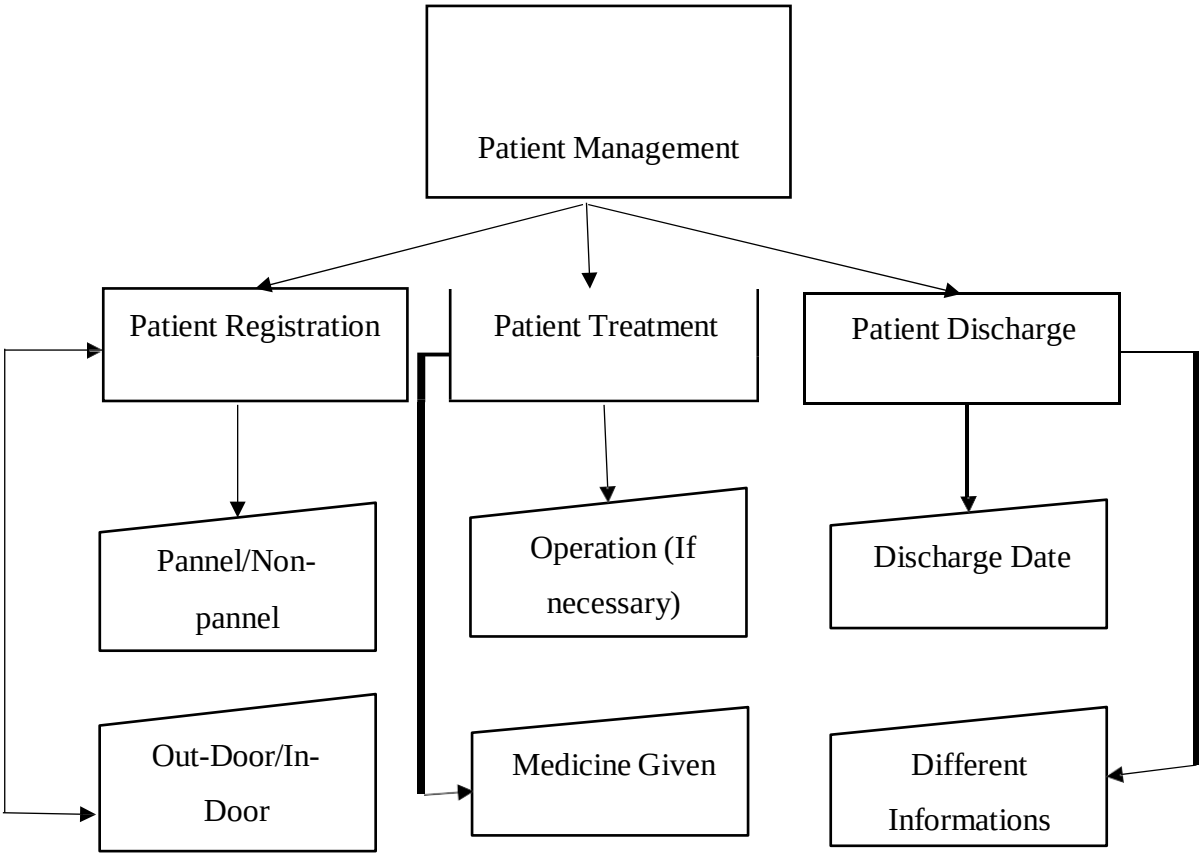


Figure 8: Patient Block Diagram

3.6.4 Pharmacy Management

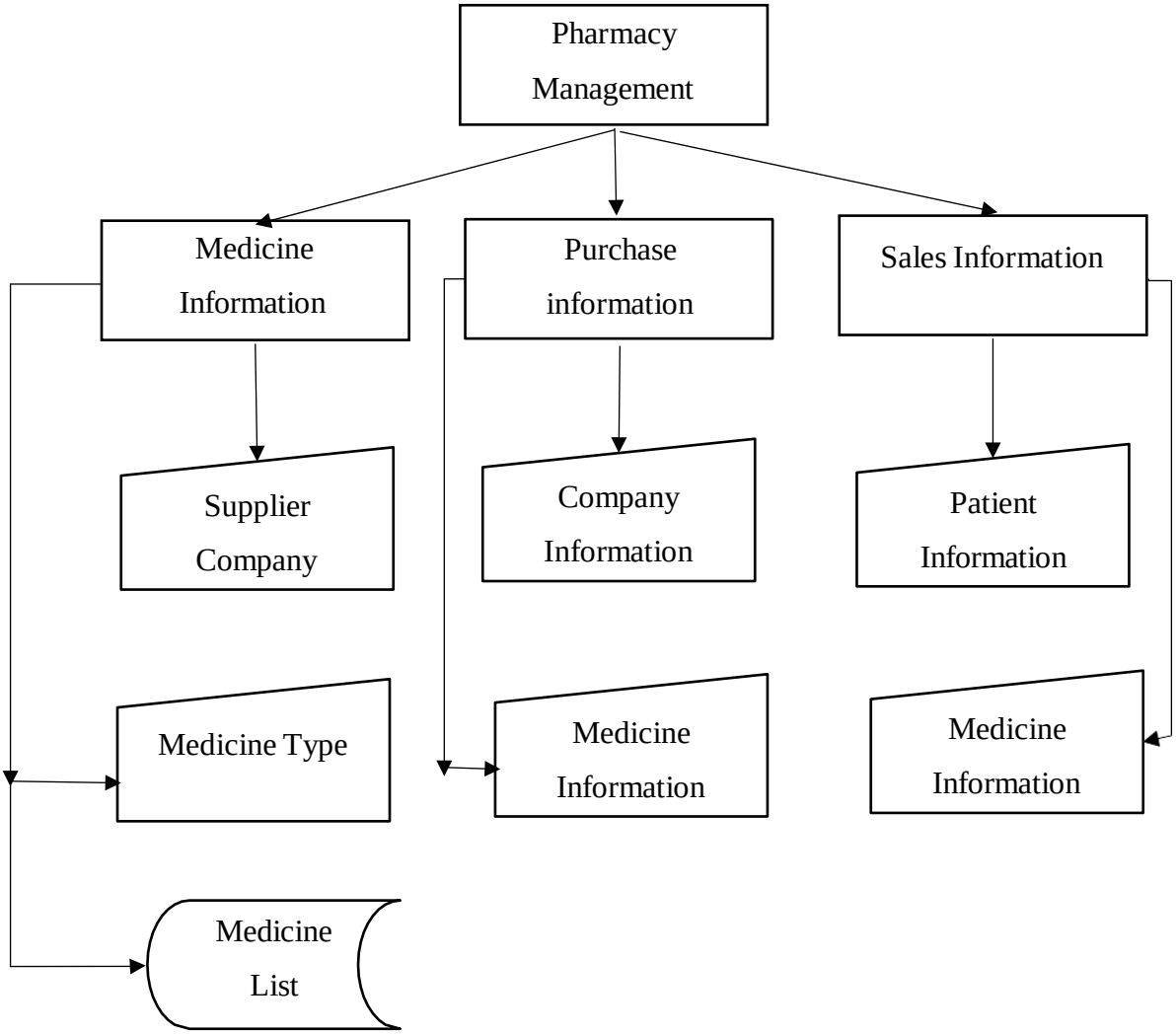


Figure 9: Pharmacy Block Diagram

3.6.5 Store Management

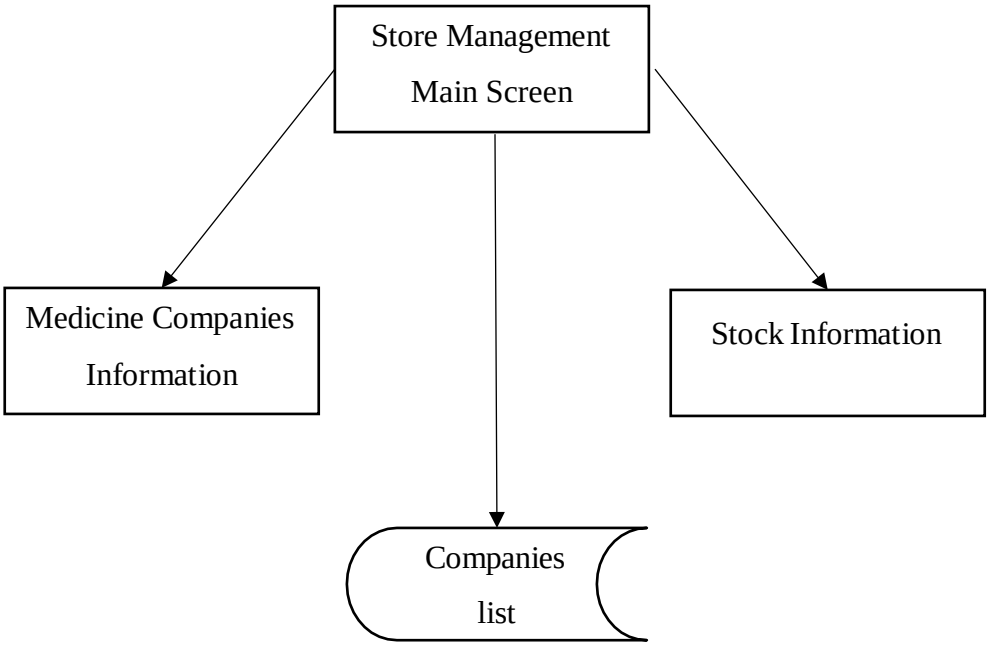


Figure 10: Store Block Diagram

3.6.6 Laboratory Management

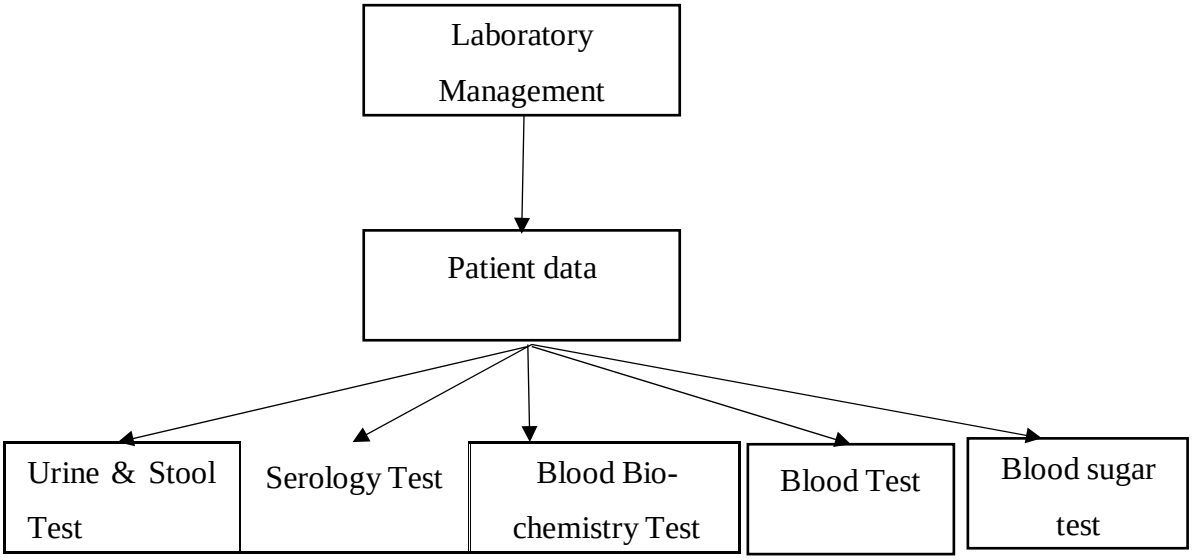
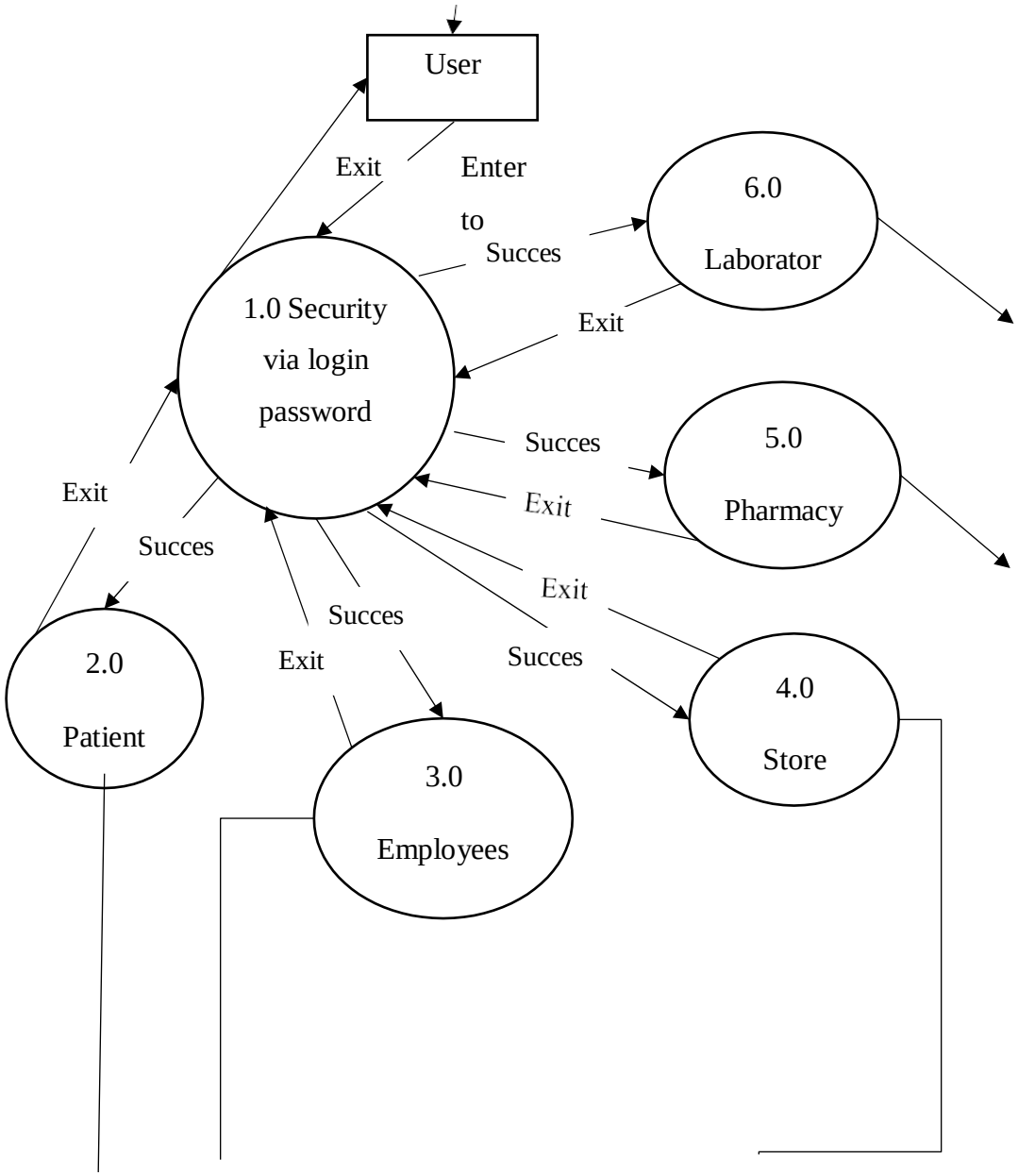
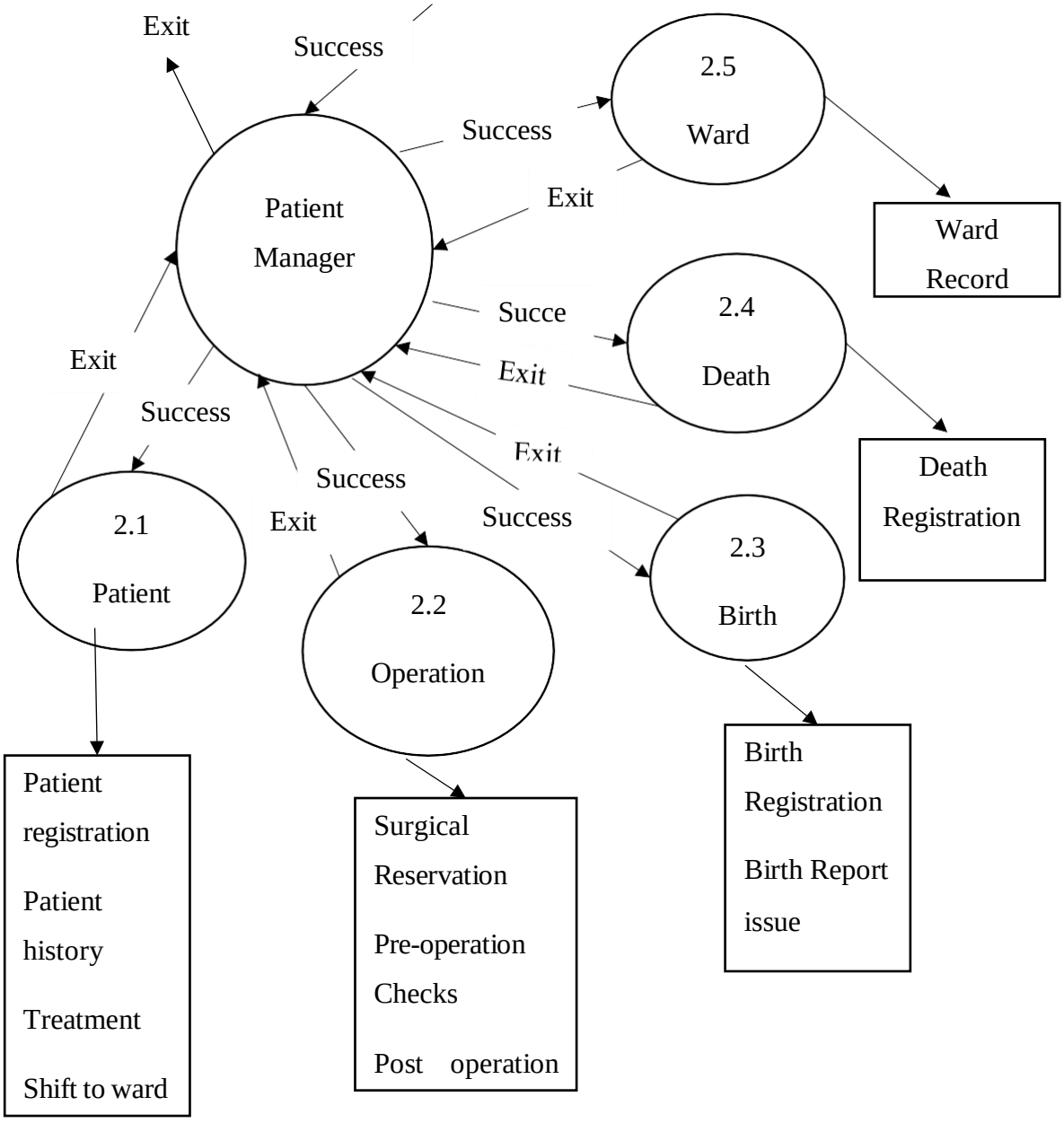


Figure 11: Laboratory Block Diagram

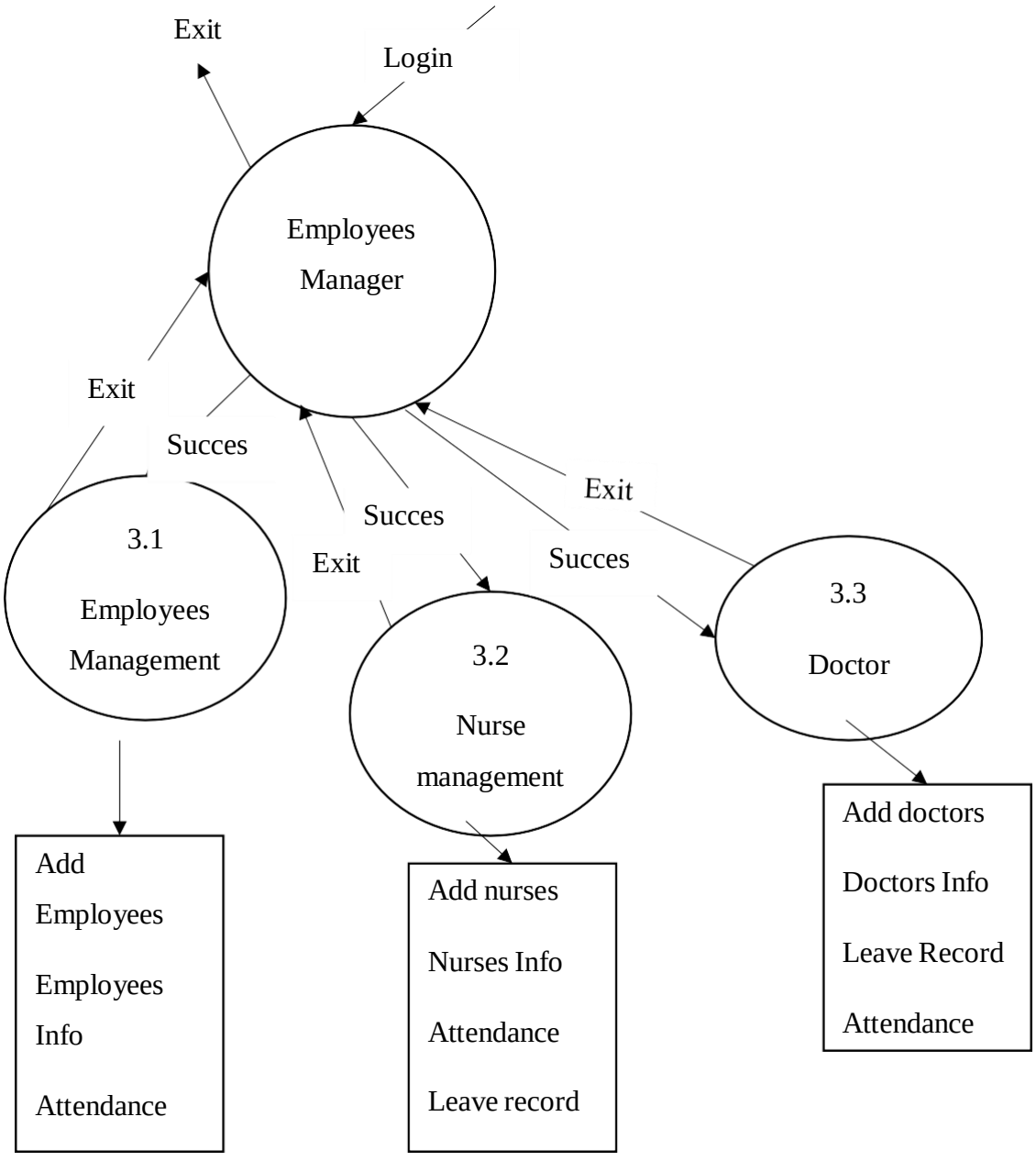
3.7 THE DIAGRAM LEVEL-0 DFD



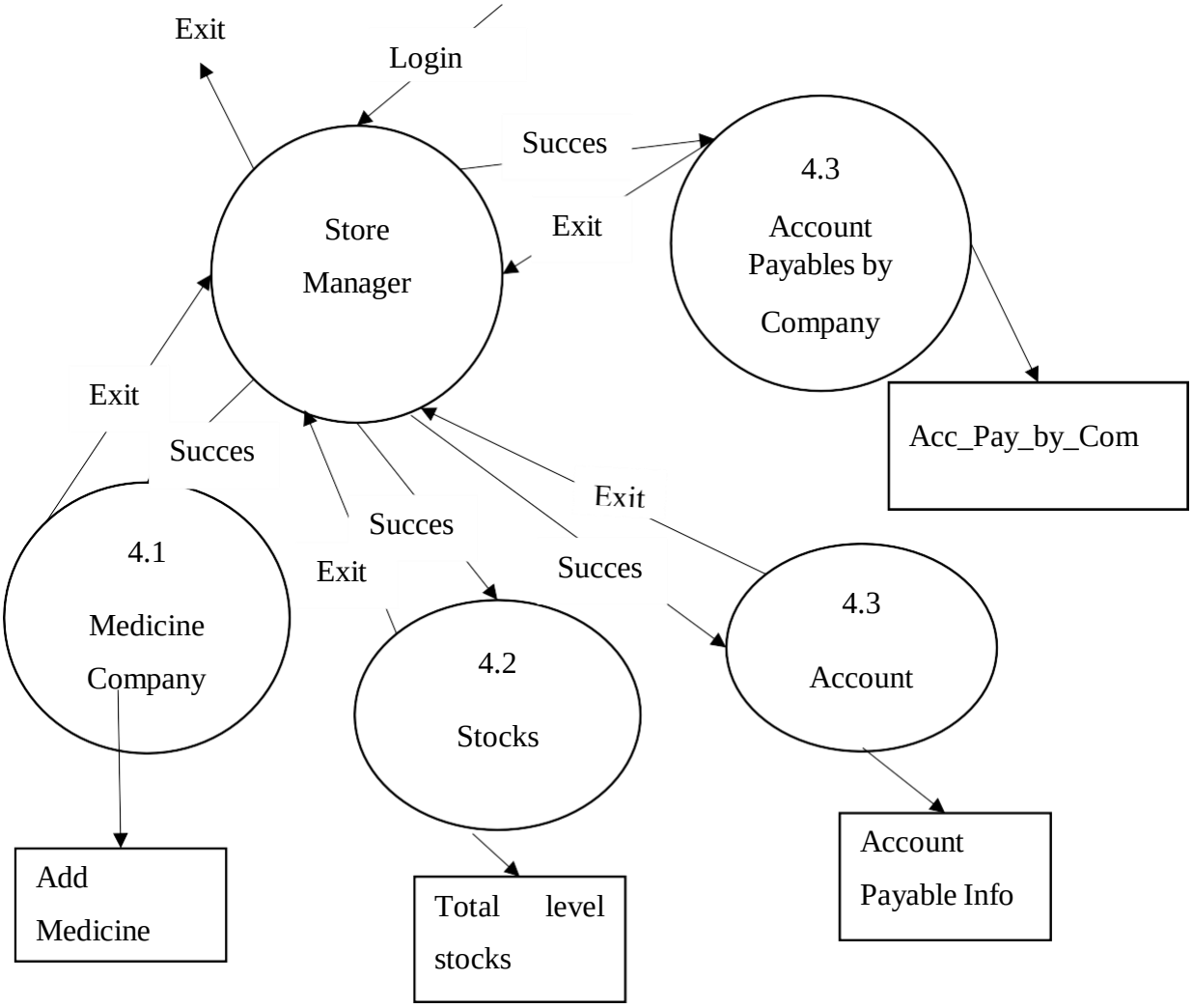
Contd. From process-2



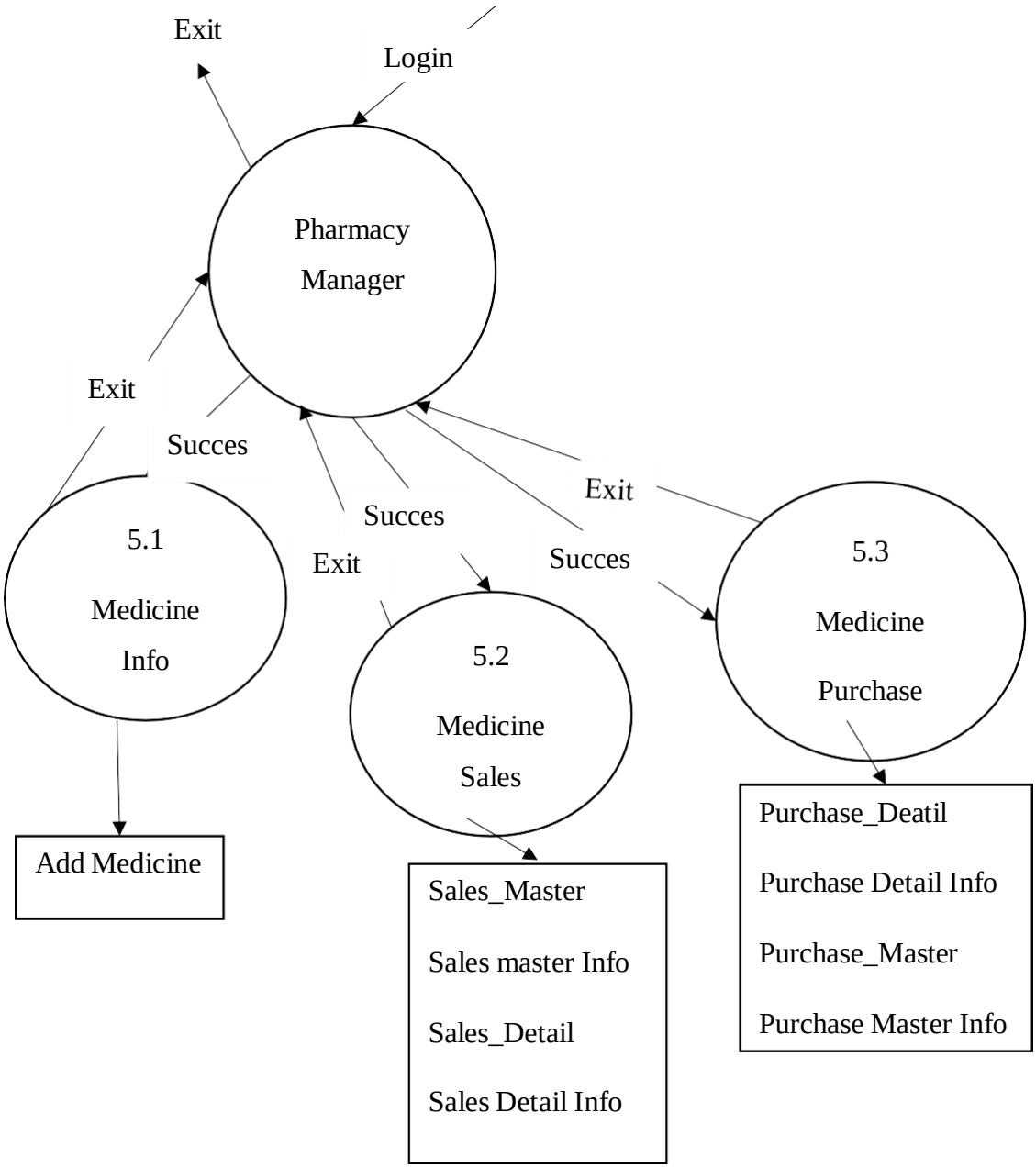
Contd. From process-3



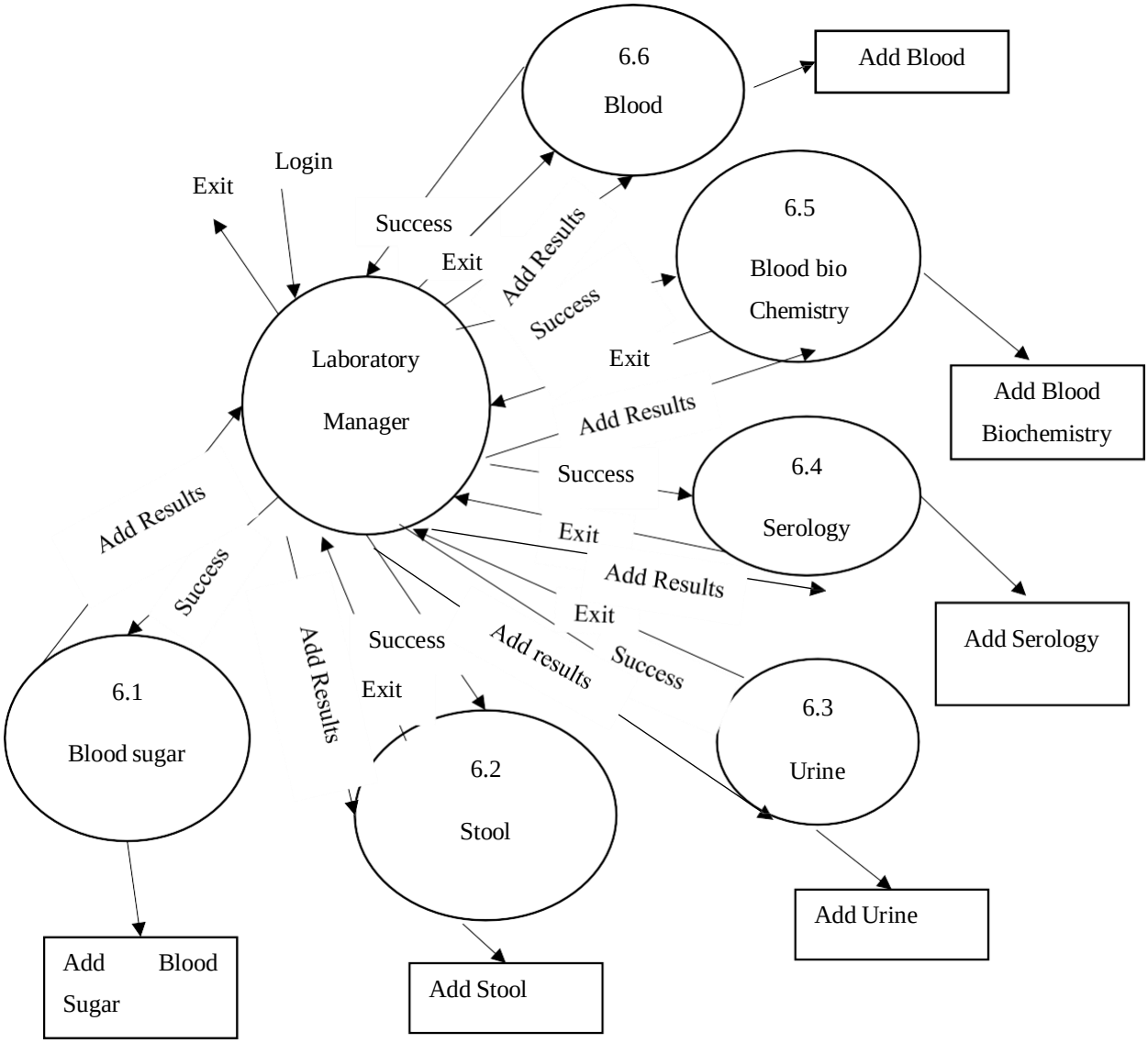
Contd. From Process-4



Contd- from process-5



Contd. From process-6



CHAPTER 4

SYSTEM DEVELOPMENT

The system development phase is more practical compared to the previous phases because this phase involves the realization of the actual system. The computer programs are written, and arrangements are made to train the personnel (Rahim *et al.*, 2020). This chapter will discuss the various forms developed and also provides a view about the choosing of software in terms of project development. In this chapter, the discussion would also be on various software issues like what triggers are and how they are used on other items as well.

4.1 Introduction to system developement

Once the system is proposed and the system design phase is completed, the system analyst moves towards the development phase of the software, according to the proposed system and the design phase specifications. The system development phase is more practical compared to the previous phases because this phase involves the realization of the actual system. The computer programs are written, and arrangements are made to train the personnel (Sabih *et al.*, 2013).

4.2 System development

The whole on the personnel information for the Riphah IIMCT-Pakistan Railway Hospital is developed into the SQL* PLUS and the SQL* FORMS. Moreover, the SQL* MENU and SQL* REPORT WRITER have been used to develop a new, improved, and well-designed interface. Before discussing the system development phase, it seems too good to illustrate the terms used during the discussion (Malik *et al.*, 2014).

4.2.1 Forms

The SQL FORMS and the SQL* PLUS can be used to insert, delete and manipulate the stored data/information in the database tables. However, SQL* FORMS allows quick development application for entering queries, updating, and deleting the data. Instead of writing the complete programs, it is quite easy to develop applications through the SQL* FORMS which makes the designing of the interface rather easy through the utility known as the SCREEN PAINTER. The SQL has been used mainly for the creation of database tables and the views (if necessary). Whereas the views are the logical representation of the tables).

4.2.2 Data Block

A form must contain at least one block. Each data block may correspond to tables, views or database stored procedures. There may be one or more blocks associated with a form.

4.2.3 Base-Table Data Block

A base-table data block is that block which is associated with a database table. Such a block contains one or fields of the database table.

4.2.4 Master-Detail Relationships

A master-detail relationship is an association between the two or more base- table data blocks. In other words, one is used as a master base-table data block and the other used as a detail base-table data block. The relationship between the blocks reflects a primary key to the foreign key relationship between the tables, on which the blocks are based.

4.2.5 Screen Painters

It is a full screen painter/editor in which one can quickly move the fields around; add text boxes and other boxes or changing the text displayed for a field.

4.2.6 Triggers

The triggers are internal objects that are fired/invoked against certain events. Actually, a trigger is a set of executing commands written in the PL/SQL, which is integrated with the Oracle database. Triggers strengthen the programming language. The triggers are associated with the events pointed in SQL* FORMS. An event is an action, which occurs when a form is executed. They can be defined on a field or a block, or a form. An example of the event is pressing the enter key in a text box. A trigger WHEN-VALIDATE-ITEM associated with this event can be linked with that text box. So, whenever the enter key would be pressed in that text field, this trigger would be fired.

4.2.7 Alerts

Alerts are the internal objects that when invoked at runtime are displayed as modal dialog boxes i.e., every other operation in the application is halted, till the alert is dismissed. The alert can be dismissed by pressing one of its buttons or sometimes by closing the window. The alerts

are always associated with the other Oracle objects. Every alert must have at least one button or three buttons at max.

4.3 Report generation

The process of report generation is carried out with the help of SQL* Report. Writer, utility of Oracle. The SQL* Report Writer combines text formatting with SQL query capabilities. The SQL* Report Writer is composed of two programs which are used together to drive information from a database. That is why we can say the report generation is a tow step process and the two programs used to generate a report are defined as follows:

4.3.1 Report Text Formatter (RTF)

The RTF is a general-purpose text formatter, used for a variety of word processing applications. It is used to control the formatting of the information, such as horizontal and vertical margins, centering, tabulation, page numbering and actual placement of text. The important point to note is that the RTF must be in connection with RPT.

4.3.2 Report Generation

The Oracle Report Generation enables us to extract the information from a database and include this information in the generated reports. It allows specific data output formats, which include report heading and printing information. Another important point is that it allows incorporating data with RTF commands and text, to produce the desired report. Following are the reports with their names are described below:

Table 3: Different types of reports.

Serial No.	Report Name
1	Blood Biochemistry
2	Blood Sugar by Date
3	Blood Sugar by Name
4	Blood Sugar Test
5	Blood Test
6	Department List
7	Department List by Location
8	Department List Hospital
9	Discharge Patient List by Date
10	Doctors List
11	Employee list
12	Employee list by department
13	Indoor patient
14	Medicine companies list
15	Medicine list by company
16	Medicine sales by date
17	Non-panel indoor patient list
18	Nursing staff gender wise
19	Nursing staff list
20	Nursing staff time wise
21	Outdoor patient list
22	Outdoor patient list by from to date
23	Purchase information by date
24	Serology
25	Stock information
26	Stool report
27	Stool test
28	Total wards

29	Urine test
30	Ward search
31	X-ray report

4.4 Menu bras

The menu bars are used for navigational purposes. I have used the following:

- Employee menu bar
- Laboratory menu bar
- Patient menu bar
- Pharmacy menu bar
- Store menu bar

4.5 Selected software functionalities

One of the most difficult tasks after specifying the proposed information system requirements is to determine whether software is capable of fulfilling the system requirements. After considering several database tools available these days, I have selected Oracle/Developer 2000 as the most appropriate tool for the development of the proposed information system of *RIPHAH Hospital- Pakistan Railway Hospital*. It is so because Oracle is a complete Relational Database Management System (RDBMS). The major features, due to which I have selected the Oracle/Developer 2000 for the development of *RIPHAH Hospital- Pakistan Railway Hospital* information system, are as follows:

- **Multi-User Support:** The most important feature of the Oracle is that it is multi-user software. The applications developed in Oracle can be connected into a powerful distributed as well as centralized database environment. It provides a powerful client/server relationship between the server and its clients.
- **Security:** Oracle provides strict security to the applications developed in the package by enforcing usernames and allotting passwords to them. Without giving a valid password, it is not possible for anybody to access the database and the applications. Moreover, it makes possible the grating of different types of access for the different users. The different accesses include inserting, deleting, updating etc.

- **Portability:** The Oracle is fully portable with over 80 distinct types of hardware and operating system (O.S.) Platforms, including VMS, MVS, UNIX, MS DOS, OS/2 and Macintosh. In Developer 2000 we can convert our binary file into a text file, which is independent of any platform.
- **Oracle Products:** Oracle provides a number of sophisticated products for the development of applications. The SQL* PLUS, PL/SQL, SQL*FORMS, SQL* MENUS, and SQL* REPORT WRITER are the distinguishing tools of the Oracle corporation.
- **Procedural Language:** The Oracle provides a powerful procedural language extension to SQL, known as PL/SQL. The PL./SQL significantly increases application performance and Developer 2000 productivity, while enhancing the power and functionality of the other Oracle products. With the help of PL/SQL statements, we can write procedures and functions just like any other procedural language. A number of other facilities are also available which allow easy manipulation of data structures along with the data stored in these structures. For example, Oracle provides import and export utilities with the help of which, it is possible to move structures along with data contained in these structures from one system to another system.

CHAPTER 5

HMIS IMPLEMENTATION

The implementation phase of the proposed information system is the last step in the System Development Life Cycle (SDLC). This will help the developer to check whether all the necessary measures have been fulfilled and work in integrated environment or not. This chapter will discuss certain techniques through which testing would be done. Due to time limitation this phase has been touched barely.

5.1 Introduction to system implementation

The system analyst must perform certain tests and look into the possibilities of users converting from the existing system to the proposed system. The implementation phase is initiated at the beginning of the development where with an implementation plan. Hence, the implementation phase has two phases i.e., the system testing and the system conversion.

5.2 System testing phases

The system testing phase starts by executing the programs with the intention of finding the errors and bugs. The pre-calculated 'data' is entered into the programs, processed and then finally output/results are tallied with the end-user required results. The system testing phase is completed in following three steps:

5.2.1 Unit Testing

In the unit testing step, different modules of the developed system are tested, independently. The purpose of this testing is to determine if each module is functioning properly, if not, then locate logical as well as syntactical errors. The advantage of this type of testing is that we can find, locate, and debug/rectify the bugs/errors at modular level. Each and every module is tested and checked in detail by entering pre-calculated data and then matching the results of the processing with required ones. In this way very few chances of the errors are left behind.

5.2.2 Integrated Testing

After completing the unit testing step, the integrated or combined testing of all the modules is carried out. The purpose of this step is to determine whether the modules are correctly integrated

with each other. Moreover, the purpose is to ensure those correct forms invoked be different menu options, as they are developed separately from the application.

5.2.3 System Testing

The system testing is performed to ensure that the developed information system is operating according to the desired specifications and requirements. The main objective is to determine the inconsistencies in the developed system. For example, it may be possible that in one module year field has been assigned a number of data type, in the other module it has been assigned character data type. Therefore, through steps we can find, locate, and remove all such and other inconsistencies from the developed information system.

5.3 System conversions

The system conversion is the process of replacing the old system with the new well-designed information system. There are three different methods for system conversion andensuring the proper performance of the developed system.

5.3.1 Parallel Conversion

In this conversion or approach, both new and old systems run side-by-side. It means that the users continue to use the old system, while learning and operating the new system. The results of both systems can be tallied or matched at any time for finding out any discrepancy or inconsistency. This is the safest approach of system conversion, because in case of the failure of a new system, the user may immediately turn back to the old system without any wastage of time and data. This failure may be due to inability to handle certain transactions or understanding certain type of process errors. However, the disadvantage of this approach is the cost. It means that the management has to pay for running the two systems in parallel.

5.3.2 Direct Conversion

In the direct conversion or approach, the old system is replaced immediately by the newly developed information system. It requires a carefully designed implementation plan. As soon as this plan is enforced, the old system is abandoned. So, there will be no parallel activities going on. The direct conversion does not cost extra. However, there is a threat of losing the data and information in the case of failure of the newly developed system.

5.3.3 Pilot Approach

In this method of system conversion, the newly developed system is implemented in one particular area of the organization of the department. While all the remaining departments of the organization use the old system. Thus, such system conversion is carried out in parts. When the newly developed system is found successful in one area, then it is implemented in all the remaining departments of the organization. The only advantage of this approach is that it provides sound bases for the whole system to install.

5.4 Proposed system conversion

After a thorough analysis of the different approaches used for the system conversions, I have suggested the parallel conversion method for the implementation of the newly developed system. Although the extra cost and the workload factors are drawbacks in this approach, which can be avoided by using direct conversion, the parallel conversion is still best. As far as I think, the threat of extra cost etc. is not so significant as the failure of the newly developed system. In the case of parallel conversion, the old system will be available as a backup. The outputs or results obtained from the new system can be compared with the required results of the old system. This would permit changes and adjustments, if required, to the new information system without disturbing information flow order.

5.5 System evaluation

Finally, the system analyst goes through the evaluation phase. In this phase he/she reviews the system to see whether the objectives of the proposed system have been achieved or not. A major factor during the system evaluation is to evaluate the system with the perspectives of the user interface. Some of the measurable human factors, which are the core in of evaluation, are the ease of use, rate of errors, speed of performance i.e., how long does it take to carry out the benchmark set of tasks, subjective satisfaction i.e., how many end-users like using the different aspects of the system and retention over time i.e., how well does the end-users retain his/her knowledge. Every system analyst likes to succeed in every category, but he/she is used to force trade have to be sacrificed. All the above-mentioned factors do not guarantee a unique interface and there is always room to the improvement. In developing the proposed system, all these factors were kept in mind, strongly. But as mentioned earlier, one has to do away with some factors, so the merits of the system are accompanied by some demerits too.

5.5.1 Features of the System

The newly developed information system of *Riphah IIMCT-Pakistan Railway Hospital* is accompanied with a variety of features. Some of the main features of this information system are being given below:

- ***Efficiency*:** The collection of information about patients, medicines, and medical tests etc. for various operations, especially for the discharge report and hospital billing, was one of the main problems, encountered in
- ***Riphah IIMCT-Pakistan Railway Hospital:*** The development of new computerized information system of the *Riphah IIMCT-Pakistan Railway Hospital* has given an efficient and on-line information storage and retrieval. This would increase the efficiency and the productivity of the *Riphah IIMCT-Pakistan Railway Hospital*.
- ***Reduction of the Error Rate*:** In the newly developed information system of the *Riphah IIMCT-Pakistan Railway Hospital* the rate of error is extremely. Since the forms used for input, updating etc. have been designed properly. Moreover, appropriate messages have been given by using alerts, triggers etc. for user guidance. So, the rate of error will be considerably reduced.
- ***Accuracy*:** The data validation checks have been used in the newly developed information system. They ensure the correct data entry operations on the database. Moreover, the validation checks implement the policies of *Riphah IIMCT-Pakistan Railway Hospital* making the newly developed system more intelligent. This system would work accurately even if the end-user does not know the rules and regulations of the *RIPHAH Hospital- Pakistan Railway Hospital*.
- ***Efficient Exploration of the Database*:** The queries often make the information system more interesting. So along with data entry, the operator can enter a query for the exploration of database. These queries are syntax free i.e., the end-user has to tell what he/she wants, the information system will provide the end-user with his/her required result.
- ***List of the Values***: A list of values is provided whenever and wherever necessary. That is why the end-user does not need to remember the code numbers of different users, medicines, medical tests etc. The user can retrieve the list of values by pressing the F9-key or clicking the mouse in the relevant text box.
- ***The Code Numbers & the Actual Values*:** The code numbers and the actual names have been stored in the master tables. Although, both the code numbers and the actual names have been

displayed in the list of values, but only the code numbers have been used in the detailed forms and the actual names have been used only for the display purpose to ease the end-user.

- ***Better Response Time*:** The fields on which the search can be made are indexed to reduce the response time for the generation of the queries, reports or any other information. So, the system provides pretty good response time.
- ***Device Independence*:** The information system developed for the *Riphah IIMCT-Pakistan Railway Hospital* is not machine dependent. This information system can be used on any IBM or IBM-compatible computer system equivalent to or above the Pentium-2 having at least 64 MB RAM. As far as the operating system is concerned, the Oracle is fully portable on over 80 distinct types of operating system (O.S.) platforms, including VMS, MVS, UNIX, MS DOS, OS/2 and Macintosh. In Developer 2000 we can convert our binary file into a text file, which is independent of any platform. So, there is no need to worry about the portability of this information system of the *RIPHAH Hospital- Pakistan Railway Hospital*.
- ***Modularity*:** This information system of the *Riphah IIMCT-Pakistan Railway Hospital* is divided into a number of modules, which are integrated together to fulfill the end-user's requirements. Although all of these modules are integrated in the form of a complete information system, in most of the cases these modules may function independently.

5.6 future enhancements

Although, this information has been designed and developed to achieve all the possible objectives of the *Riphah IIMCT-Pakistan Railway Hospital* of the present and future yet is impossible for any information system to be cent percent perfect. Event cent percent perfections cannot be expected from any man-made system anything other. Although I've tried my best to remove all the bugs' i.e. logical and syntactical errors, even then I cannot give a hundred percent error free guarantee of this software. Some of the possible reasons are given below, due to which enhancement may require. Also, the hospital itself is a multi-discipline organization so I have tried to cover the most important aspects which are generally the hour of need. The document will help in future enhancements of the system. This project does not cover the financial module such as payroll calculation and doctor's daily charges calculation and etc. due to time limitation and constraint.

Since this information system has been developed in the modular form, the functionality of this information system can be improved by adding more modules into it. Firstly, it is possible that the *Riphah IIMCT-Pakistan Railway Hospital* may increase size and working, in future due to which enhancement of the information might require. Secondly, the end-user and the management may demand more queries and reports, then in that case, the existing modules can be modified, and new ones can be added. Thirdly, the rules, the regulations and the policies may be changed and hence modifications in the information system would be required.

5.7 External and internal interfaces

- ***External Interfaces*:** This could be the centralized server which should be a high-end machine as the software works in both client server and local desktop environment. So, for this way the server must be high end machine that can process frequent client requests. Client side can be any normal machine.
- ***Internal Interfaces:*** These are the software interfaces or screens.

5.8 Justification of ROI

Table 4: Justification of ROI.

Estimated costs of the HMIS implementation (PKR)	
Software purchase and licensing fees: PKR	5,000,000
Hardware and infrastructure	3,000,000
Customization	2,000,000
Training	1,000,000
Maintenance and support	500,000/y
Estimated benefits of the HMIS implementation (PKR/Y)	
Improved patient outcomes	10,000,000
Reduced staffing costs	3,000,000
Increased revenue	5,000,000

ROI of the HMIS implementation	
ROI	(49,500,000 / 16,500,000) x 100%=270%

5.9 Revenue generation opportunity

- This table assumes an average patient stay of 3 days and an average daily revenue of PKR 10,000 before implementing HMIS.

Table 5: Revenue generation.

Year	No. of Admissions	Avg Length of Stay (Days)	Revenue per Day (PKR)	Total Revenue (PKR)
1	10,950	3	11,000	142,635,000
2	11,400	3	12,100	175,788,000
3	11,900	3	13,310	213,171,000
4	12,400	3	14,630	253,912,000
5	12,900	3	16,062	298,137,000
Total	**59,550**			**1,083,683,000**

5.10 Cost benefit calculation

Table 6: Cost benefit calculation.

Year	Annual Cost Savings (PKR)	Annual Revenue Generation (PKR)	Total Annual Benefits (PKR)	Total Cumulative Benefits (PKR)
1	3,750,000	533,963,000	537,713,000	537,713,000
2	4,500,000	700,759,000	705,259,000	1,243,972,000
3	5,250,000	887,109,000	892,359,000	2,136,331,000
4	6,000,000	1,096,942,000	1,102,942,000	3,239,273,000
5	6,750,000	1,334,759,000	1,341,509,000	4,580,782,000
Total	26,250,000	4,353,532,000	4,579,722,000	4,580,782,000

Modules

Test Report Date

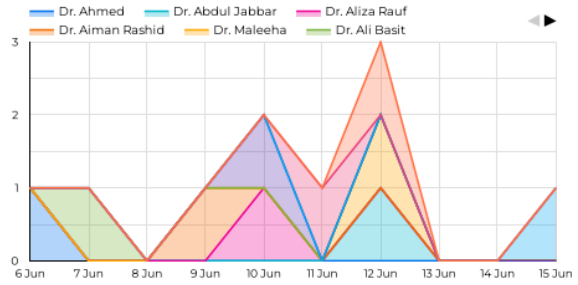
Name

REGISTRATION MODULE

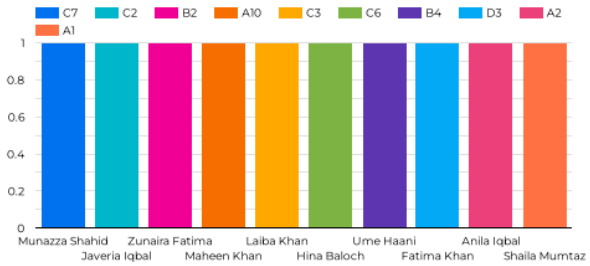
	MR No.	Refer to	Refer to
1.	BA_553454	Level 2	
2.	AD_343242	Level 1	
3.	UY_234544	Level 1	
4.	AU_343532	Level 2	
5.	TY_234323	Level 3	
6.	UI_124343	Level 1	
7.	AJ_324234	Level 2	
8.	AC_432545	Level 3	
9.	AB_324352	Level 3	
10.	AB_565322	Level 1	

1 - 10 / 10

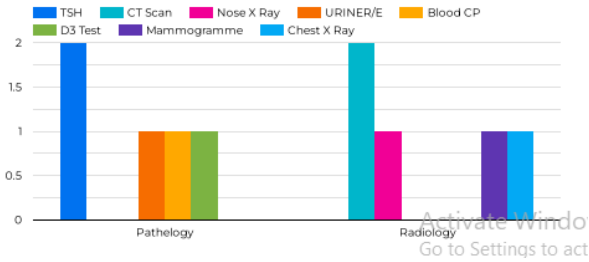
DOCTOR'S MODULE



NURSING MODULE



RADIOLOGY AND PATHOLOGY



Activate Windo
Go to Settings to act

District Dashboard

Last Updated: **16 April, 2023** at **11:39:17 PM**

Suspected Cases

Total	Awaited	Negative	Inconclusive	Positive
274,097	4,531	260,736	948	7,882

Confirmed Cases

Total	Active	Recovered	Expired
7,882	1 0.01% 0	7830 99.34% 0	51 0.65% 0

Lab Test Break-up

Total	Completed	Rejected	Awaited	In-Transit	In-Process
169,612	156,157 0	7,858 0	5,597 20	5,583	14

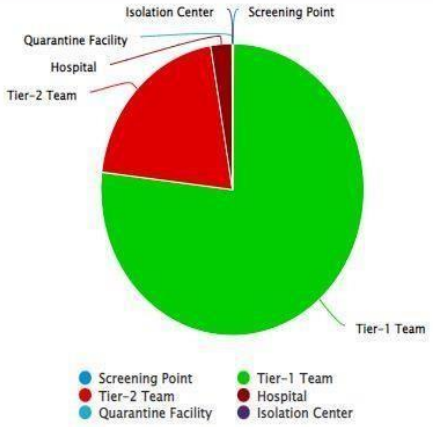
Active Cases By Facility Type

Total	HOSP	HDU	ISO C	QRTN	HOME QRTN	Others
1	0	0	0	0	0	1

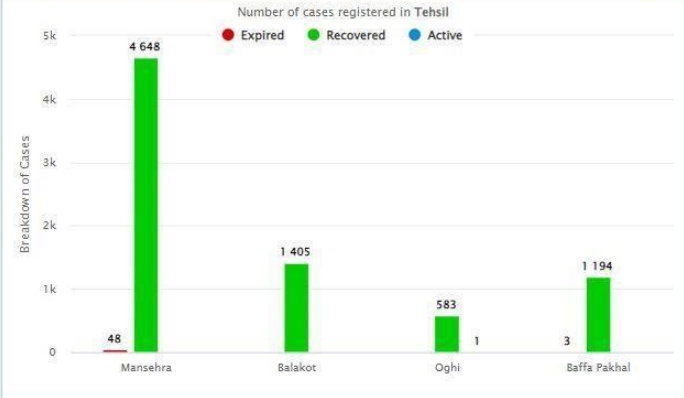
District Facilities Summary Top Facilities in District / Number of Patients in Facility Types

Top Facilities By Patients

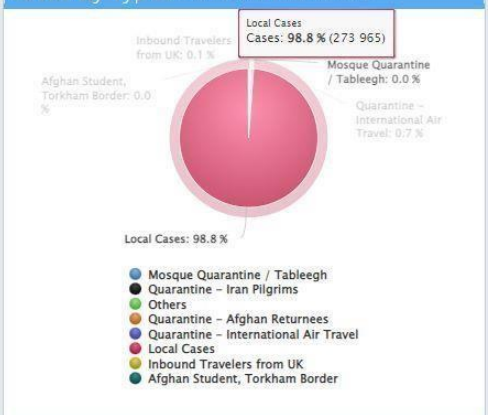
#	Facilities	District	Total	Active	Recovered	Expired
1	Tier-1 Team Rapid Response Team Mansehra	Mansehra	2340	0	2338	2
2	Tier-1 Team Rapid Response Team Balakot Mansehra	Mansehra	1379	0	1379	0
3	King Abdullah Teaching Hospital Mansehra	Mansehra	1357	0	1311	46
4	Tier-1 Team Rapid Response Team Baffa Mansehra	Mansehra	1194	0	1191	3
5	RRT Team II, Mansehra	Mansehra	902	1	901	0
6	Tier-1 Team Rapid Response Team Oghi Mansehra	Mansehra	569	1	568	0
7	Madni Masjid Mansehra	Mansehra	25	0	25	0
8	Type D Hospital Balakot	Mansehra	23	0	23	0
9	RHC Shinkiari	Mansehra	20	0	20	0
10	Type D Hospital Oghi	Mansehra	15	0	15	0

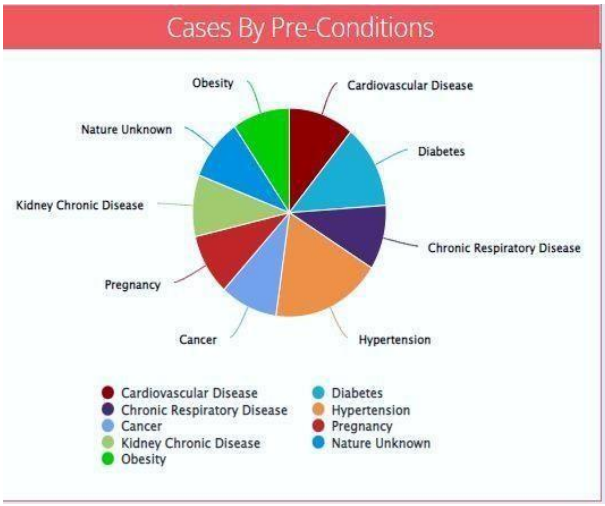


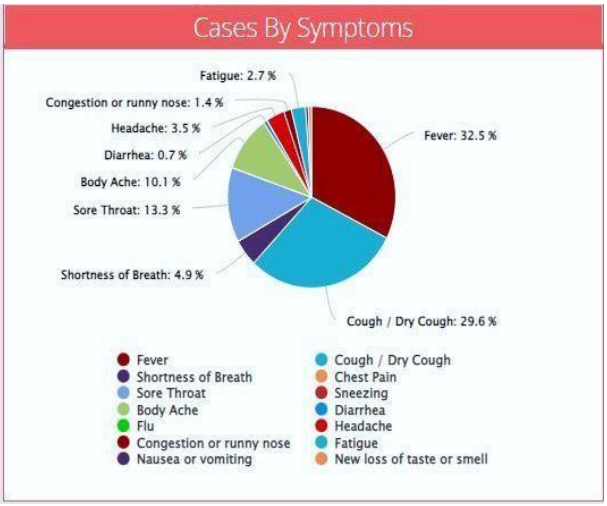
Tehsil Cases Breakup (Active, Recovered, Expired)



Cases By Types International, Returnees etc




Cases By Pre-Conditions
Obesity
Cardiovascular Disease
Nature Unknown
Diabetes
Kidney Chronic Disease
Chronic Respiratory Disease
Pregnancy
Cancer
Hypertension
Cardiovascular Disease
Chronic Respiratory Disease
Cancer
Kidney Chronic Disease
Obesity
Diabetes
Hypertension
Pregnancy
Nature Unknown


Cases By Symptoms
Fatigue: 2.7 %
Congestion or runny nose: 1.4 %
Headache: 3.5 %
Diarrhea: 0.7 %
Body Ache: 10.1 %
Sore Throat: 13.3 %
Shortness of Breath: 4.9 %
Fever: 32.5 %
Cough / Dry Cough: 29.6 %
Fever
Shortness of Breath
Sore Throat
Body Ache
Flu
Congestion or runny nose
Nausea or vomiting
Cough / Dry Cough
Chest Pain
Sneezing
Diarrhea
Headache
Fatigue
New loss of taste or smell

CHAPTER 6

THE USER GUIDE

This chapter of the user's guide discusses various operations and functions that can be performed on the database, as required by the *Riphah IIMCT-Pakistan Railway Hospital* and its management. This chapter describes the various considerations that a user should know in order to work with the system and environment of the software.

6.1 Introduction to user guide

The user's guide has been included in the project report to describe the working or functioning of the computerized information system of the *Riphah IIMCT-Pakistan Railway Hospital*, Rawalpindi. This computerized information system of the *Riphah IIMCT-Pakistan Railway Hospital* has been designed and developed for any IBM of IBM-compatible computer system. The *Riphah IIMCT-Pakistan Railway Hospit*al information system would be executed from the three terminals i.e., reception, pharmacy, and medical laboratory. However, it is possible that another terminal can be installed in the office of chief executive officer. The data and information would be stored in the database table, through the forms, designed for this purpose whereas the information would be retrieved in the shape of queries on the forms and reports on the printer.

6.2 Logging on and logging.out

Since, this information system would be operated in a multi-user environment, so it would require the services of DBA to perform the various functions and tasks, such as:

- Creating new users.
- Ensuring the efficiency of the information system

Installation and configuration of the Microsoft Windows NT or the Microsoft 2000 is the very first step towards the system implementation. The second step is the installation of Oracle 8i. The third step is the installation of the *Developer 2000 version 6i*.

It seems necessary to describe that 'Oracle engine works, stores and manipulates data in the database at back-end, whereas the Developer 2000 processes at the front-end. All the things e.g., form, reports and graphics, you see on the monitor screen and printers are the results of *Developer 2000*.

When installations of the oracle and Developer 2000 are completed, then the next step is to click the Start Menu, then Programs, then Oracle for Windows NT-OraHome81 and then click the SQL Plus 8. 0. Now log on as an Administrator by using username SYSTEM and password MANAGER. Run the import utility namely IMP. EXE from the *ORACLE ORA81\BIN*. Follow the instructions prompted by the system.

Now paste the Hospital folder in C:\ drive and open the Developer Form window. Now from C:\Hospital Source-Code open the file welcome_to_the_Ripah_general. This is the main screen of the system. Click to run the form. It will ask the user about the login name and password. Enter login as *Scott* and password as *tiger*. Now the application will run.

From the sub-menus and the code forms you can go to any form and then perform your required functions. You can select any option from the main menu, a relevant form will flash before, and this form further contains different buttons or icons like NEXT, PREVIOUS, FIRST, LAST, SAVE, CANCEL, NEW, QUERY, SHOW, SHOW ALL, CANCEL QUERY, DELETE, EXIT etc. You can enter new records and save them. You can even put queries in the forms and see your required results. In the report submenu, different options are available. Select any one of them, answer the dialog boxes and then see or print the result of your input data.

6.3 Important considerations

Before using the *Riphah IIMCT-Pakistan Railway Hospital* information system, it will be very useful and beneficial for the end-user to have the knowledge of the following definitions.

- **Text boxes:** It is the basic unit in the form designing. The form layout uses the text boxes to store and retrieve the information from the database.
- **Status line:** It is the bottom line on the screen, on which status of the system is given e.g., working, number of retrieved records etc.
- **Message line:** The message line is displayed at the bottom of the input form, in which the additional messages for the user help have been given**.**

6.4 Record navigations

The process of record navigation means moving among the retrieved record. For this purpose, different buttons namely FIRST, NEXT, PREVIOUS, LAST have been given on all the forms. You can go into the enter query mode by pressing the relevant button or F8-key, enter the criterion, and finally press the relevant button or F9-key. The information system will return you

the result of your query. If more than one record is retrieved, then you can move among the retrieved records by using the different buttons on the input form.

6.5 Record manipulations

There are the four possible operations that can be performed on a record i.e., insertion, retrieval, modification, and deletion. The description of each operation is given below:

6.5.1 Add Operation

If the end-user wants to enter new a record into the database, he will have to follow the following steps:

- Select your required form from the main menu.
- Click on the NEW button. The text boxes will be cleared.
- Enter the information to be stored in the database.
- . Click on the SAVE button to store the entered record.

6.5.2 Delete Operation

If the end-user wants to delete a record from the database, he will have to follow the following steps:

- Select your required form from the main menu.
- Click on the QUERY button. Enter the query criteria. Press the EXECUTE button.
- Select the required record and then press DELETE button.

6.5.3 Modify Operation

If the end-user wants to delete a record from the database, he will have to follow the following steps:

- Select your required form from the main menu.
- Click on QUERY button. Enter the query criteria. Press the EXECUTE button.
- Select the required record and modify the record.
- Press UPDATE button

6.5.4 Retrieve Operation

If the end-user wants to delete a record from the database, he will have to follow the following steps:

- Select your required form from the main menu.
- Click on the QUERY button. Enter the query criteria. Press the EXECUTE button.

6.6 Report generation

To generate a report, select the report option from the menu options. Select your required report type from the menu, answer the dialog box, the report will be generated, and you can obtain it on the printer, and monitor screen as well.

6.7 Special considerations

Since, the *Riphah IIMCT-Pakistan Railway Hospital* information system has been developed in the *Oracle 8i and Developer 2000,* which operate in the Microsoft Windows 2000, so the user must have enough knowledge of this information system. Every user must have a valid log in account and password assigned to him/her by the system administrator. Then he/she would have authority to access the *Riphah IIMCT-Pakistan Railway Hospital* information system. The computer system must be carefully shutdown, after exiting form the *RIPHAH Hospital- Pakistan Railway Hospital* information system. Otherwise, carelessness may result in the loss of data or even system failure.

6.8 Security implementation

The security implementation is the duty of the Database Administrator (DBA). Moreover, he is responsible for enabling the user to use the Oracle database and the information system. Before accessing the Oracle database and information, the user must have access to the computer system and the operating system, by having a valid user account and password recognized by the Microsoft Windows 2000. To get access to an Oracle database, he/she must have an Oracle username and password. The data dictionary stores the information about every username i.e., whether the user has CONNECT RESOURCE and DBA privileges. At any time, the DBA can create a new Oracle user by using the SQL statements.

CONCLUSION

The Hospital Management and Information System for *Riphah IIMCT-Pakistan Railway Hospital* will be a comprehensive desktop-based software system targeted for the microcomputer operating platform. The HMS will replace the *Riphah IIMCT-Pakistan Railway Hospital's* cumbersome manual, paper-based information system. The Hospital Management and Information System is designed to be easy to use, featuring a graphical user interface similar to that found on most Windows applications. The functions of the Hospital Management and Information System for *Riphah IIMCT-Pakistan Railway Hospital* will follow those performed by hospital staff using the current manual system. Operation of the Hospital Management and Information System for *Riphah IIMCT-Pakistan Railway Hospital* should be almost intuitive to existing staff as it is modelled after existing procedures. This is viewed as a key feature of the system, as it will enable existing staff to utilize the system with minimal training. A key advantage of the Hospital Management and Information System for *Riphah IIMCT-Pakistan Railway Hospital* is that it will consolidate the hospital's data stores into one central location. This will enable easy management of all information and ensure data integrity across the entire breadth of the system. The Hospital Management and Information System for *Riphah IIMCT-Pakistan Railway Hospital* will enable hospital administrators to more efficiently utilize both human and capital resources effectively and cost-efficiently. The Hospital Management and Information System for *Riphah IIMCT-Pakistan Railway Hospital* will reduce time spent by staff admitting patients, scheduling, and performing other tasks. It will also ensure that hospital facilities are utilized to their greatest potential.

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APPENDICES